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ABSTRACT

To measure school achievements in spina bifida children, to relate these measures to certain variables, to obtain information on educational problems, and to study facets of cognition and its changes with age, 77 spina bifida children and 53 amputees (all aged 5 to 15) were tested. Sixty non-disabled children were at times used for controls. The findings indicated that children with spina bifida and hydrocephalus lagged behind other handicapped children in reading, arithmetic, psycholinguistic abilities, richness of interpersonal recall, and listing of occupations. The spina bifida hydrocephalic children showed better performance in verbal ability than in performance skills and tended to act socially deprived regardless of verbal intelligence. Non-hydrocephalic and amputee children seemed to show normal social awareness. Indications are that spina bifida children need earlier attention to avoid misplacement in academic levels and to help prevent cognitive and academic problems. Extensive appendixes and tables are provided. (Author/JM)

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Department of Health, Education and Welfare
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Preface

We would like to thank the many people who assisted in the execution of this study. Drs. Leon Greenspan and Angela Badell-Ribera, Mrs. Nancy Stoer and Miss Aimee Mc Donnell and Dr. Julian Brower--members of the clinical staff of the Institute of Rehabilitation Medicine who contributed their expert knowledge of these children. Mrs. Ronnie Gordon, who pointed out some of the manifestations of problems of the children at younger ages. Mr. Christian Poole, who designed the figures, and Miss Joyce Winsborough, who typed this report. Several research assistants, Steve Karten, Amy Lewinger, Eleanor Bernstein, Michael Jacobowitz, Barbara Le Winter and Benjamin Lee also helped in the data gathering. Dr. Louis Gerstman, Dr. Herbert Goldstein and Miss Rochelle Abend helped in data processing and analysis. This study would not have been possible without the co-operation of the New York City Board of Education, especially Dr. Marcus Arnold who helped us in our search for subjects. Dr. Morton Kreuder of the Center for Urban Education aided us in the procurement of non-disabled children as subjects for some of our studies. Henry Viscardi, Richard Switzer and the staff of the Human Resources Inc. of Albertson, New York were particularly gracious and helpful.

In the organization of this report we have presented our findings as a series of interlocking studies. Several of the studies are presented as appendices either because they failed to provide information which was important to the major thrust of the study or because they have been reported elsewhere, (Kastner & Diller, Reversal learning in spina bifida children. APA proceedings, 1968).

The parents of the children who participated and the children themselves deserve a word of thanks, as do the members of the Spina Bifida Parents Association who supported the study and are eagerly waiting for its outcome because of their great concern about the education of their children.

Part I : Introductory Section

Summary

One hundred and thirty disabled children ages 5-15, (45 spina bifida hydrocephalic, 32 spina bifida non-hydrocephalic and 53 amputees) were examined on a variety of educational, social, cognitive and medical measures in a series of interrelated studies. For some of the studies two groups of non-disabled children were utilized including 30 middle class and 30 lower class non-disabled children (grades 1-6), and 80 middle class children (ages 4-7). The findings suggest that children with spina bifida and hydrocephalus lag behind other groups of handicapped children in reading (18 mos.) and arithmetic (36 mos.), intelligence psycholinguistic abilities (11-30 mos.), richness of interpersonal recall and listing of occupations. A much higher per cent of the spina bifida hydrocephalic children do not attend regular schools than the other disabled children in our study, school placement appears to be associated with management of incontinence rather than mental functioning. There appears to be a disassociation of abilities in the SBH children so that even in instances in which they achieve the same scores on tasks as do other children, it may be through the use of different abilities. Hence teachers might be drawing the wrong conclusions about the child's mental functioning if they assume competence in one ability from competence in another. The SBH children are generally better in verbal than in performance skills, but their productivity on tasks related to interpersonal or social content resembles that of lower class children rather than of children of their own social class. In general, factors associated with disability appear to preempt the role of the factors involved in the social environment, so that the SBH child acts as though socially deprived despite his verbal intelligence.

Both the spina bifida non-hydrocephalic groups and amputee children appear to show normal academic and mental development and the normal influence of socio-cultural factors with regard to the effect of socio-economic status, family size home situation, ethnicity and ordinal position. Some observations suggest, however, that some SBNH are placed in non-regular academic tracks and that this is associated with a lowered verbal intelligence.

Spina bifida children therefore deserve more aggressive educational intervention so that they may be serviced by various agencies at earlier ages and thus help prevent cognitive and academic problems. Special attempts should be made to provide both enriched environments and educational programs which will take cogniaance of the child's defective ability in integrating verbal and action systems. Educational institutions should work closely with medical institutions and families to provide early and systematic treatment for problems of incontinence. Programs of special education should examine some of the consequences of the abilities of spina bifida children, not only in terms of academic attainments but also in terms of the other facets of cognitive, emotional, social and occupational maturity.

INTRODUCTION

I. Problem - Children with spina bifida manifesta and myelomeningocele have received little systematic attention from the standpoint of the educator and the behavioral scientist. This stems in part from the wide-spread pessimism which has existed in the field of medicine until the very recent past concerning their life span. Lack of attention may also be related to social forces. There are, for example, no organized parent groups with the impact comparable to that of the parents of cerebral palsy, mental retardation or brain injury, which have called community attention to this disease entity. The medical community has tended to reassess its thinking with regard to spina bifida in the past 25 years. In 1944 Frisch wrote "...the extreme forms of hydrocephalus are relatively rare, and because such cases are incompatable with life, they are hardly of psychological interest." However, with more effective neurologic and urologic procedures, and the application of modern techniques or rehabilitation (Badell-Ribera, et. al., 1964), there is evidence that this group of children will become more noticeable as a clinical entity deserving systematic study.

For the educator a wide range of questions exists, from the most elemental (e.g. what percent of children attend school) to the highly sophisticated (e.g. what is the relationship between extent of ventricular dilitation and perceptual disturbance). These problems may be subdivided into the following major areas, which give rise to specific questions:

1. What are the educational achievements of children with spina bifida?
2. How are factors such as transportation, extent of handicap, presence of hydrocephalus, ways of managing incontinence related to schooling?
3. What are some of the cognitive, personality and social factors which are pertinent in describing these children, and how are they related to education?
4. How does educational, cognitive and personality functioning change in a school age population?

II. Background - Spina bifida associated with myelomeningocele is a birth defect in which a segment of the spinal cord is defective and generally protrudes to the surface of the body through defects in the dorsal parts of the vertebrae. As a result of this skeletal and soft tissue deformities are frequently found. Children with this birth defect have varying degrees of muscle weakness at the level of the lesion or muscle weakness in those muscles innervated by the segments of the defective spinal cord, sensory loss, incontinence of bowel and bladder in about 66% of the children, and, in 75% of the children, hydrocephalus. In the majority of children with hydrocephalus, it spontaneously arrests before the age of two. As a result of this defect less than 50% of the children are independent in the functional activities of daily living, and less than 33% of them can ambulate without appliances. These associated disabilities are cited to reveal the complexities of the problems facing the child, the teacher and his parents. This study, though primarily concerned with the behavioral and learning problems of a group of children having this birth defect, some of whom had hydrocephalus and a group that did not have hydrocephalus, is also concerned with psychological problems related to their mobility and incontinence. It is essential to point out that, although the children were segregated into groups that had and did not have hydrocephalus, there may be degrees of brain damage in the non-hydrocephalic children. This situation results from the fact that, prior to the onset of head enlargement, there is dilatation of the cavities of the brain which in itself affects neural functioning. It is for this reason that we have elected to include a given child in the hydrocephalic group upon clinical evidence of an episode of increased intracranial pressure rather than increase in the circumference of the head.

An extensive discussion of the medical aspects of spina bifida is provided by Smith (1965) and Swinyard, et.al., (1966). Estimates of the incidence of spina bifida vary from .71 in every 1,000 live births to 2.0 in every 1,000 live births (Alter, 1962). Although Tizard (1967) in a survey of the epidemoiology of the problem in England suggests that there are regional differences in the occurrence of spina bifida based on socio-economic considerations in accordance with the general picture of anencephaly, congenital malformations and infant mortality, the picture is far from complete. For example, Erhardt and Nelson (1964), reporting on a New York City population during 1958-1959, found a lower incidence of spina bifida in non white populations than in white populations. A similar finding is reported by McMahon, Pugh and Ingalls (1953). Swinyard and Shahani (1966) have reviewed some of the ecological factors which are pertinent.

The relatively few prior psychological studies of these children reveal the following salient facts:

A. Education - Spina bifida children appear to be educablt (Laurence, 1958, Laurence and Coates, 1963, Stephen, 1963, Eckstein and McNab 1966, Tizard 1967, Burns 1966). There is, however, no solid evidence about the specifics of their educational attainments either based on the results by objective tests or based on an analysis of their educational problems. Furthermore, all of their studies have been conducted in the British Isles and have been performed with specific reference to English educational practices.

B. Intelligence - Children with spina bifida manifesta who remain in the community are generally not retarded, although those with accompanying hydrocephalus tend to lag in intelligence (Stephen, 1963, Badell-Ribera, 1964). It is unclear whether the lag is related to associated neurologic defects which are generally greater in children with hydrocephalus, to restricted environmental opportunities which might be expected with greater physical impairment, or to some other mechanisms, e.g., different kinds of social or parental pressures facing the child with hydrocephalus. Laurence (1962) found no relationship between head size or cortical thickness and intelligence. There is some parallel between intelligence and severity of physical disability. He found a slight relationship between age and intelligence and speculated that as children overcome their physical handicaps, they have more energy available to apply to the test situation.

C. Personality - Hadenius (1962) reported that in a sample of 26 hydrocephalic children 13 (50%) had behavior problems. A number of observers have noted (Laurence, 1958, Taylor, 1959, Diller, et.al., 1966) that some spina bifida children talk a great deal, but appear to say little, manifesting a chatterbox quality, referred to as the "cocktail party" syndrome.

D. Cognitive Development - On a similarities task young children with spina bifida and hydrocephalus (age 4½-8½) lag behind controls, but by adolescence they appear to have caught up. On a motor encoding task (non-verbal) the younger spina bifida child (age 4½-8½) compares favorably with other children, but with increasing age they fall increasingly behind (Paddock, 1966). It was noted also that spina bifida children were embarrassed in performing a motor encoding task, whereas their controls were not, and many of the spina bifida children insisted on talking about the test items while performing them. This suggests that cognitive development differs from that of normal children in complex ways.

In the context of this group of medical and psychological studies, the educator may ask several level of questions: 1) Questions about basic factual and phenonomenologic information related to schooling and the disability, which may be specific to this entity; 2) Questions about behavior in this group of children which may be illustrative of a more general situation. The former type of question points to a need for basic actuarial and correlational approaches where the variables are not essentially exceptional. The latter type of question calls for more specific instruments to test selected hypotheses. We plan to pursue both types of questions.

III. Objectives

A. To obtain measures of school achievements in spina bifida children.
B. To relate these measures to a wide range of psychological, neurological, and social variables.
C. To obtain information on the nature and incidence of educational problems which interfere with education, and ways in which children, parents, and teachers adapt to these problems.
D. To carry out a number of specific studies on different facets of cognition following from prior work at our center, and to examine changes in cognition with age.

The strategy for attaining these objectives is by a series of substudies which are interrelated. It should be noted that the number of subjects is not constant from study to study. Subject attrition was due to the time consuming nature of our test batteries and the age appropriateness and concomitant ceiling effects of some of our tests.

Following the presentation of the method we will organize the results in the form of individual chapters, Achievement, Psycholinguistic abilities, Intelligence, Verbal associations in children, Aspects of schooling, and Correlates of SES.* In each of the chapters we present the findings with the instruments appropriate to it and relate these findings to those reported in the previous chapters. Each of the chapters will incorporate relevant age comparisons.

---

* Socio-economic status.

METHOD

Population - The population for the major study consisted of two groups of disabled children ranging in age from 5-15. The groups were drawn from those attending the Institute of Rehabilitation Medicine New York University Medical Center. The population consisted of 77 children with spina bifida which was subdivided in some of our studies into two groups. 45 children with hydrocephalus (SBH) and 32 non hydrocephalus children (SBNH). The other major population group consisted of 53 children with amputations.

Three of our spina bifida subjects were seen in the public schools of New York City, which granted us permission to visit classrooms, speak to teachers and examine children attending classes for handicapped children. Three of our subjects were also seen at a special school for handicapped children, conducted by Human Resources Inc., Albertson, New York. All of these children had been known to our rehabilitation program, so that they may be said to be part of the population drawn from the rolls of the Institute of Rehabilitation Medicine.

All the testing and studies on the children were conducted at the Institute of Rehabilitation Medicine except those children seen in the public schools, the special school at Albertson and six children who were seen at home because the testing begun at the Institute of Rehabilitation Medicine was incomplete.

In two substudies we used non-disabled children. In one substudy concerned with the development of verbal association ability we examined 60 children in an integrated school bordering the Harlem area in New York City. Half of the children studied in this setting were white and middle class and the other half were of Negro and Puerto Rican background and were from lower class homes. In the second study concerned with psycholinguistic factors in mediational learning. The subjects were drawn from a public school in a middleclass suburb of New York City. The characteristics of the subjects are described in the relevant substudies in which they appear.

It will be convenient throughout the report to employ initials for these populations:

SB - Spina Bifida
SBH - Spina Bifida Hydrocephalic
SBNH - Spina Bifida Non-hydrocephalic
AMP - Amputee Controls
LC - Lower Class Normal Controls.
SBHSC - Spina Bifida hydrocephalic in special class.
SES - Socio-economic Status

UC - Upper Class Normal Controls
SBNHRC- Spina Bifida Non-hydrocephalic in regular class.
SBNHSC--Spina Bifida Non-hydrocephalic in special class.
SBHRC-- Spina Bifida hydrocephalic in regular class.

Measures

Each child received the following measures according to administration procedures set forth in the respective test manuals. They were also scored according to procedures as outlined in the manuals.

1) Metropolitan Achievement Tests--Each subject was administered the appropriate test by his age. The following subtests were included, Word Knowledge, Word Discrimination, Reading, Arithmetic Computation Arithmetic Problem Solving. The preschool battery included: Word meaning, sentences, information matching, numbers and copying. (Sample size: SBH=33, SBNH=26, AMP =45).

2) Wechsler Intelligence Scale for children (in entirety) (Sample size: SBH=37, SBNH=28, AMP=22).

3) Four subtests of the Illinois Test of Psycholinguistic Abilities:
    Auditory Decoding (AD), Verbal Encoding (VE), Visual Decoding(VD) Motor Encoding (ME), (Sample size: SBH=39, SBNH=26, AMP=28).

** 4) Harris Draw A Person Test. (Sample size: SBH=37, SBNH=23, AMP=44).

** 5) Reversal Learning (after Kendler and Kendler, described in the text) (Sample size: SB=64, AMP=35)

** 6) Frostig Visual Motor Perception test. (Sample size: SBH=37, SBNH=17).

7) Goldstein Scheerer Test. (Sample size: SBH=44, SBNH=32, AMP=53).

8) Interpersonal Recall tasks- The subject is asked "To name all the people to whom he talked or thought about yesterday.!" Afterwards the list is read back to him and he is asked - "Whom does the first name of the list remind you of, i.e. who on the list is most like this person and why..." This is repeated for each name. This method is an explanation of the thinking of Kluever (1933) who more than three decades age proposed that the method of equivalent stimuli, which proved so useful in comparative psychology, might be used to study personality. This task, its rationale and its survey is discussed in more detail.

9) Recall of jobs - The subject is asked to list all the occupations of which he can think.

10) Recall of leisure time activities - "List all of the leisure time activities that you do."

11) "List all of the animals you can think of."

12) Other Measures-(A) Social Scales
    * (1) Parental occupation- rated on a scale ranging from Blue Collar Low to White Collar High (6 point scale) (Appendix A).
    * (2) Parent Income rated on a scale from under $2,999 a year to more than $15,000. (6 point scale)(Appendix A).
    * (3) Parent Education (Nonschool to complete college) (6 point scale) (Appendix A).
    (4) Ethnicity - White, Negro, Puerto Rican.
    (5) Household climate scale - Social workers rated the extent of marital conflict in the home.
    (6) Away from home - Does the child live with his family or not.
    (7) Birth Order.

* Scales presented in Appendix A.

The first three scales (1,2,3,) which pertain to aspects of parental social class were combined to form a weighted socio-economic scale. (Appendix A).

** Appendix G.

B) Medical Ratings

(1) Medical rating of severity of disability derived by Badell-Ribera et.al. (1964) (Appendix B) in our setting to describe severity of the handicap in children with spina bifida. This is a 5 point scale which has proved useful in previous studies in our center, it takes into account the neurosegmental level of the spinal cord defect and its functional sensory and motor correlates.

(2) Presence or absence of hydrocephalus in our spina bifida population.

(3) Location and extent of disability in our amputee children.

C) Parental questionnaire

A questionnaire designed to cover schooling was mailed to each parent known to us (see Appendix C). This questionnaire covered issues such as type of school attended, means of transportation to school, devices used for ambulation, extent and means of handling incontinence, child's preferred activities, estimate of how well child is doing academically.

D) Adjectival count of descriptions of child's behavior during the course of his examination by a clinical psychologist.

Part II : Findings and Analysis

Chapter I : Achievement

Summary: The data in this section indicate that SBH children are less competent in reading and arithmetic than either SBNH or AMP. However the difference between SBH and SBNH in arithmetic is not significant. There is a great deal of variability within the spina bifida-non-hydrocephalic group but in general they achieve about as well as the Amputees. As a group our SBH children were about 1½ years behind the amputees in reading and 3 years behind in arithmetic. Despite this general achievement lag the SBH children can achieve in school, although they do not attain the levels reached by the Amputees.

General Findings: Reading

The relevant data on school achievement age are presented in two basic formats: first as graphs and then as tables depicting the growth of reading and arithmetic achievement for our three groups (spina bifida-hydrocephalus, spina bifida-non-hydrocephalus, amputees). The data used in generating the graphs were also analyzed to determine if statistically significant differences in achievement existed among the three groups. Graphic and statistical presentations are also presented at three age levels for all groups.

The data in Figure I* reflect curves for the cumulative percent of children obtaining school age equivalents derived from an average of their scores on the three Reading Subtests of the MAT. In the case of the youngest children, these scores were obtained from the preschool tests. In the case of the older children, they were obtained by averaging Word Knowledge, Word Discrimination, and Reading of the MAT. The graph permits us to order the data from two different instruments which do not have a common scale. Since the groups are equal in age (Table I), the acceleration of the curves indicate that the scores of the SBH tend to cumulate more rapidly at a lower level than do the scores of the other groups. A similar effect is noted in Table I, which presents the cumulation of school age scores in reading achievement at the 25th, 50th, and 75th percentiles for the 3 groups.

TABLE I

Comparison of SBH, SBNH and AMP on Combined Reading Age of MAT Percentiles.

	CA			3 Quartiles of Reading Age (Months)		
	N	M	SD	25%	50%	75%
SB H	33	113	41	** B	95	116
SB NH	26	116	40	85	111	142
AMP	45	115.2	40.6	B	112	142

* Figures in Appendix A

** Readiness Rating.

Analysis of the differences in school age among the three groups as depicted in Figure I results in the following findings as determined by the Kolmogorov-Smirnov test:

1) SBNH have signigicantly higher school age scores than those SBH ($X^2 = 5.375, p < .05$).
2) AMP have significantly higher school age scores than SBH ($X^2 = 6.85, p < .05$). Furthermore, there is no difference in school age, reading achievement, between AMP and SBNH.

Figure 2 contains graphic data in terms of a cumulative percent on school age scores in arithmetic achievement for the three groups of disabled children. The scores at the 25th, 50th, and 75th percentile (Table 2) reveal that the amputee group exceeds the spina bifida groups. The two spina bifida groups appear to be more similar in arithmetic than in reading tests.

General Findings: Arithmetic

TABLE 2

Comparison of Arithmetic Achievement Age in Spina Bifida-Hydrocephalus, Spina Bifida-Non-Hydrocephalus, Amputees at Different Percentiles

	CA			3 Quartiles of Arithmetic Age (Months)		
	N	M	SD	25%	50%	75%
S B H	29	118.5	34.5	91	103	124
S B NH	22	129.4	33.0	88	116	123
AMP	38	124.0	30.9	115	137	146

Analyses of the difference between the three groups in school age achievement in arithmetic by the Kolmogorov-Smirnov test, results in a significant difference between the SBH and AMP groups ($X = 7.26, p < .025$); no differences were found in the two other group comparisons (SBH vs SBNH, SBNH v AMP).

Comparison of School Achievement by Age Groups: Reading

TABLE 3

3 Quartiles of Averaged Reading Achievement at Three Age Levels

	Young (5-7)				Middle (8-10)				Old (11-15)			
	N	25	50	75	N	25	50	75	N	25	50	75
S B H	11	E	D	B	10	90	103	111	9	89	115	128
S B NH	6	E	D	C	10	87	121	140	10	100	123	150
AMP	18	D	C	A	10	97	122	136	16	117	136	163

The data suggest that regardless of age, the children in the amputee group read better than the children in both of the spina bifida groups (Figure 3), (Table 3, Figure 4). Although there is a considerable overlap in the graphs of reading in all three groups at the youngest age level, by the middle age level differences of a high magnitude appear. The difference between the median reading age of the amputee and the hydrocephalic children in this age group (8-10) is 19 months. This difference increases to 21 months when the median reading age of the hydrocephalic and amputee children in the oldest group is compared. More than half the amputee children in the middle exceed the highest score of the hydrocephalic children in the middle group, and more than half of the amputees exceed all but the 2 highest scores in the oldest group. This finding is substantial at both age levels when comparing the individual subtests on the reading section of the MAT. These data, therefore, support the notion of a partial cumulative lag--in this case in reading competence. This lag might be due to the fact that as a result of their disability SBH children spend a good deal of their first 7 years in hospitals. Therefore they usually do not begin school until they are 7. They begin school with a 2 year lag and our data indicate that this lag is maintained.

Comparison of School Achievement by Age Groups: Arithmetic

TABLE 4

3 Quartiles of Average Arithmetic Achievement at 3 Age Levels

	Young				Middle				Old				
	N	25	50	75	N	25	50	75	N	25	50	75	
S B H	9	E	D	B	12	95	103	124	8	89	101	122	29
S B NH	5	E	D	C	8	81	86	113	9	92	122	154	22
AMP	14	D	C	B	10	95	117	135	14	124	144	153	38

When examining the median arithmetic scores for the 3 groups of children in (Figure 5, Figure 6, Table4) the middle age group, it is interesting to note that while both groups of spina bifida children lag behind the amputees, the SBNH group is the most deficient in this age group in arithmetic competence; this might be due to their delayed school entrance. However, when the median arithmetic score for the oldest group is examined, the picture is somewhat different. Again both spina bifida groups lag behind the amputees, but now the SBH children lag behind the amputees by a greater margin than did the SBNH group in the previous middle age group. In other words, the hydrocephalic and non-hydrocephalic children switch positions when examining the middle and older age groups.

When comparing the medians for arithmetic and reading for the groups, the most striking finding is the failure of the older SBH groups to improve their arithmetic scores over the middle group, (8-10 median = 103, 11-14, median =101). This contrasts with reading performance and appears to be out of step with development in the other two groups (SBNH, AMP).

Further Aspects of Achievement

1) Achievement and Chronological Age

Another way of looking at the school achievements is to examine the relationship between school achievements and chronological age. In theory, school achievement should advance at the same rate as chronologic age so that the relationship between the two ought to be positive and significant. An examination of Table 5 reveals that this generalization holds true for the most part in the case of the amputee children. It is somewhat the case for the hydrocephalic group and less the case for the non-hydrocephalic group. The data, therefore, suggest that the school achievement for spina bifida children does not keep pace with chronologic age. In the case of the SBH in arithmetic the oldest group does not improve. In the case of the SBNH group reading does not improve in the oldest group and arithmetic dips in the middle group.

TABLE 5

Correlations Chronologic Age and MAT Scores

	Word Knowledge	Word Discrimination	Reading	Arithmetic Computation	Arithmetic Prob. Solving
SB H	*** **.48 (25)	-.05 (14)	**.53 (24)	.10 (17)	.33 (22)
SB NH	.06 (21)	-.46 (13)	.08 (19)	-.12 (14)	-.11 (14)
AMP	**.51 (28)	.09 (9)	** .51 (28)	**.68 (27)	* .43 (22)

** $p < .01$ * $p < .05$ *** Denotes N

2) Breakdown of Metropolitan Achievement Test (MAT) Performance into 5 Subtests.

TABLE 6

Means and Standard Deviations of 5 MAT Subtests

		Word Knowl.	Word Disc.	Reading	Arith. Compr.	Arith. Prob. Solv.
SBH	N	25	14	24	17	22
	M	131.2	100.2	106.9	118.4	112.2
	SD	32.2	14.7	21.0	21.3	24.9
SBNH	N	21	14	21	16	20
	M	126.5	106.6	121.8	119.5	117.1
	SD	33.5	18.9	28.8	22.2	27.6
AMP	N	28	9	28	27	22
	M	132.6	105.0	129.6	123.4	130.0
	SD	31.6	15.1	28.0	24.3	24.9

Analysis of Table 6 and Figure 7 results in the following within and between group findings. In the amputee group, achievement on four (reading, word knowledge, arithmetic computation and arithmetic problem solving) of the five subtests is approximately the same, the mean achievement score of word discrimination being significantly lower than those of word knowledge $t=2.51$, $p<.02$, reading $t=2.50$, $p<.05$, arithmetic computation $t=2.13$, $p<.05$, and arithmetic problem solving $t=2.78$, $p<.01$.

The within group comparison for the SBNH group results in only one significant t-test between the five MAT subtests, that being between word knowledge and word discrimination ($df=33$; $t=2.01$; $p<.05$). All other between group comparisons result in no further significant differences between the means of the subtests. Thus again there is approximately equal competence on four of the five MAT subtests, with word discrimination again being the area of least competence.

The analysis of the means of these subtests for the SBH group indicates that word knowledge is superior to word discrimination $t=2.30$, $p<.05$, reading $t=3.11$, $p<.01$, and arithmetic problem solving $t=2.23$, $p<.05$, while arithmetic computation is superior to word discrimination $t=2.71$, $p<.02$. All other intercomparisons do not result in significant differences.

To summarize these within group findings:

1) In the amputees there is a deficiency in one area (word discrimination) relative to the other four.

2) In the non-hydrocephalic group there is also a lag in word discrimination but it is only significant when it is compared with word knowledge.

3) There is more scatter in the hydrocephalic group. Word discrimination, reading, and arithmetic problem solving are about equal. Word knowledge is superior to these tasks and arithmetic computation exceeds word discrimination.

The fact that Word Discrimination is the subtest in which all three groups demonstrate the least competence may be due to the construction of the MAT. Word discrimination is only presented at the primary levels because it ceilings in older children. Therefore the scoring of this subtest is more rigorous than in the other subtests which do not ceiling so easily.

Between group comparisons result in only one subtest in which there is differential competence. The mean reading score for the hydrocephalic group is significantly less than that of both the non-hydrocephalic group ($t=2.00$, $p<.05$) and the amputee group ($t=3.26$, $p<.01$).

These findings are supported by an examination of the intercorrelations of the subtests of the MAT with each other which indicate a median correlation of .74 in the SBH, .89 in the SBNH and .80 in the AMP. group (see table 7).

TABLE 7

Intercorrelations of MAT subtests for the Spina Bifida Hydrocephalus, Spina Bifida-Non-Hydrocephalus and Amputee Groups.

	SBH (N=23)					SBNH (N=22)					AMP (N=28)				
	WK	WD	R	AC	AP	WK	WD	R	AC	AP	WK	WD	R	AC	AP
WK															
WD	91					89					75				
R	86	75				90	84				89	87			
AC	50	72	61			89	86	90			80	80	82		
AP	74	74	74	81		90	75	89	86		75	89	80	89	

When the table is examined further it is interesting to note that 70% of the intercorrelations for the SBH group are .75 or below, while only 10% and 20% are .75 or below for the SBNH group and AMP groups respectively. This indicates that school achievement as measured by the MAT is a more unitary function in the AMP and SBNH groups than it is in the SB H group. Apparently achievement is more task specific in the hydrocephalic group.

TABLE 8

	Reading Age/Chron. Age				Arith. Age/Chron. Age		
	SBH	SBNH	AMP		SBH	SBNH	AMP
M	.81	.92	.91	M	.83	.86	.90
SD	.20	.31	.27	SD	.27	.27	.29

Table 8 lends support to the previous findings that although the Spina Bifida groups lag behind the amputee groups on the parameters of achievement, their competence does increase with age; however, it does not increase sufficiently to equal the performance of the amputees.

Chapter II : Psycholinguistic Abilities

Summary: The SBH lags behind the other two groups (9-25 months behind the SBNH; 23-30 months behind the AMP) in the areas assessed by the ITPA. Furthermore from preadolesence on there ceases to be consistent growth in encoding skills in the SBH group. Interestingly there appears to be differential correlates of reading achievement according to both age and disability. In the youngest age group all four ITPA subtests and reading achievement are associated. However in the middle and oldest age groups there is disassociation of these abilities in the SBH group but not in the SBNH and AMP groups.

In this section we will be concerned with the following issues. Are there differences in psycholinguistic skills or patterns of psycholinguistic skills between the SBH, SBNH and AMP groups? How do psycholinguistic skills relate to each other in each of the three groups? How do psycholinguistic skills change with age in each of the three groups? How do psycholinguistic skills relate to school achievements in each of the three groups?

Differences Between and Within Groups

The SBH group appears to be inferior in both auditory and visual decoding (AD and VD) and vocal and motor encoding (VE and ME). These differences appear to be highly significant for all tests except for the auditory decoding task where the gap between the three groups appears to be narrowed, particularly between the SBH and SBNH groups. Auditory decoding appears to be the easiest task for all three groups and in the SBH group AD is superior to VE (df 57, $t= 2.33$, $p < .05$) and in the AMP group AD is superior to VD (df 53, $t=2.39$, $p < .05$). It is also the only task in which the AMP group is superior to the SBNH group (df 46, $t=2.45$, $p < .05$). The data for these findings may be seen in Table 9, 10 and Figure 8. Examiners in our setting have observed AD to be the least reliable of the ITPA subtests. The nature of the task facilitates guessing which in turn results in the tendency toward the production of inflated scores.

TABLE 9

Comparison of SBH, SBNH and AMP on 4 Subtests of the ITPA

		VD	AD	ME	VE
SBH	N	39	31	28	28
	M	79.7	91.0	77.2	75.5
	SD	23.9	27.6	28.7	23.0
SBNH	N	26	21	16	16
	M	95.5	102.0	100.4	100.9
	SD	22.0	23.6	25.9	28.2
AMP	N	28	27	17	19
	M	103.3	114.8	104.7	105.5
	SD	22.0	12.0	21.6	22.2

TABLE 10

Significant Differences Between the Means of 4 ITPA Subtests

	VD			AD			ME			VE		
	df	t	p<	df	t	p<	df	t	p<	df	t	p<
SBH vs AMP	65	4.12	.001	56	4.15	.001	43	3.40	.01	42	3.24	.01
SBNH vs SBH	73	2.69	.01	50	1.49	NS	42	2.67	.02	45	4.45	.001

Relationship of Psycholinguistic Skills with Each Other:

TABLE 11

Intercorrelations of ITPA Subtests for the Spina Bifida-Hydrocephalus, Spina Bifida Non-Hydrocephalus and Amputee Groups.

	SBH				SBNH		
	ME	VE	AD		ME	VE	AD
VD	**.50(28)	**.77(28)	**.64(31)	VD	.33(17)	**.65(17)	.40(21)
ME		*.43(27)	*.58(28)	ME		*.59(15)	*.62(15)
VE			*.52(28)	VE			.43(15)

	AMP		
	ME	VE	AD
VD	**.60(17)	*.47(19)	.38(17)
ME		.49(16)	.11(17)
VE			.16(18)

**p <.01
*p <.05

Despite the fact that the SBH group shows the greatest disparity between the different psycholinguistic abilities, these abilities appear to be more highly interrelated than they are in the other two groups. The median intercorrelations are r=.55,(N=28, p<.05), SBNH=.51 (N=15, p<.05), AMP = .42 (N=17, p<.10). The differences may be further appreciated by noting that if we divide the total of the 18 correlations in all these groups at the midpoint (.495), the SBH group has 5 correlations above, the SBNH group has 3 correlations above and the AMP group has one correlation above the midpoint (see table 11). Two explanations appear plausible to us. The superiority of the AMP and SBNH groups would compel more subjects to reach the ceiling. This would curtail the correlations in these groups. Second, if SBH children guess more, then this would underlie all of their performance and boost the correlations. However, the guesses would be most manifest in the AD task because it is a yes or no situation. The reasons for these findings which do not totally jibe with our picture of the SBH child as more variable in his cognitive skills might perhaps be better understood by examining the relation of psycholinguistic skill to age.

Relationship of Psycholinguistic Skills with Age:

If we examine the correlations of psycholinguistic skills with chronologic age, we find (a) Motor Encoding is not significantly related to age in any of the groups. (See table 12).

TABLE 12

Correlations of Chronologic Age and ITPA Scores

	VD	AD	ME	VE
SBH	**.57 (38)	**.69 (30)	.30 (27)	**.56 (27)
SBNH	**.52 (27)	*.51 (17)	.38 (17)	**.55 (22)
AMP	**.57 (28)	.47 (17)	-.08 (19)	*.42 (27)

*p $<.05$ **p $<.01$

Furthermore if we examine the growth of psycholinguistic skills by age in each of the three groups (Table 13, and Figures 9, 10) there appears to be a steady increase in abilities in all groups, with a number of significant exceptions.

In the case of the SBH group performance on tests of verbal and motor encoding does not improve between the middle and older groups, suggesting a lag in encoding skills in pre-adolescence. Some support for this interpretation may be found in the fact that Paddock (1966), working with an SBH population, reports a similar lag in motor encoding (verbal encoding was not studied) in a test which extended the upper range of difficulty by adding more items to the ME scale. An additional finding of interest is that there is a wider range of the ratio of highest minus lowest divided by lowest in the SBH group than in the other groups.

Psycholinguistic Skills and School Achievements

School achievements as measured by the five individual subtests of the MAT are related to different abilities in the different groups. These differential patterns may be seen in the following tables (14, 15).

The findings suggest that, for the SBH group, the MAT most likely taps the auditory verbal system; for the AMP group it taps the visual-motor system. In contrast, the SBNH group does not utilize any single system in regard to MAT performance. It is of further interest to note that in the case of the SBH group the MAT is related to the child's best area of performance (AD-mean = 91, SD= 27.6) and his worst area (VE-mean =75.5, SD=23.0), with regard to the reading and arithmetic problem solving subtests of the ITPA.

Table:13 Means of 4 ITPA Subtests in 3 Age Groups

		VD	ME	VE	AD	CA	Ratio:Highest-Lowes Lowest
SBNH 1	N	8	7	7	7	8	.02
	M	85.5	83.1	85.3	85.3	93.1	
	SD	26.0	21.7	33.0	26.2	21.0	
SBNH 2	N	10	6	6	9	11	.17
	M	92.6	106.5	104.5	108.4	125.1	
	SD	18.3	26.0	24.8	20.9	20.5	
SBNH 3	N	9	4	4	6	11	.09
	M	110.4	120.0	116.8	114.8	160.1	
	SD	15.2	0.0	6.5	10.0	17.8	
SBH 1	N	12	12	11	12	11	.20
	M	59.0	69.7	62.8	71.3	74.7	
	SD	14.03	32.7	12.0	21.8	12.1	
SBH 2	N	17	13	14	15	19	.38
	M	83.5	89.9	88.9	102.6	117.8	
	SD	21.8	24.5	23.2	27.5	17.4	
SBH 3	N	10	5	5	7	11	.41
	M	97.3	80.0	85.8	113.7	162.9	
	SD	22.9	14.9	20.2	11.7	12.0	
AMP 1 *	N	3	3	2	3	3	-
	M	64.7	71.3	90.0	110.0	82.7	
	SD	18.6	18.5	42.4	17.3	30.1	
AMP 2	N	13	9	11	13	13	.07
	M	104.7	110.6	110.1	113.5	116.4	
	SD	18.6	15.9	15.4	14.1	13.9	
AMP 3	N	12	5	6	11	12	.14
	M	111.3	114.2	102.2	117.7	162.1	
	SD	16.2	13.0	27.8	7.5	14.0	

* N too small for computation.

TABLE: 14

Number of significant relationships between each ITPA task and the 5 MAT tasks for each group.

	H	NH	A
VD	1	1	3
ME	-	-	2
AD	4	-	1
VE	2	-	-

Table: 15 Intercorrelation of 4 ITPA Subtests with 5 MAT subtests.

		Word Knowl.	Word Disc.	Reading	Arith. Comp.	Arith. Prob. Sol.
VD	H	*.44 (22)	.39 (14)	.39 (22)	.06 (15)	.22 (20)
	NH	.22 (20)	*.54 (14)	.22 (20)	.07 (15)	.09 (19)
	AMP	.62 (23)	.26 (9)	**.55 (28)	**.52 (28)	.24 (22)
ME	H	-.08 (18)	.52 (12)	18 (12)	45 (13)	44 (18)
	NH	.10 (11)	.50 (17)	-.05 (11)	.40 (7)	-.10 (10)
	AMP	**.50 (17)	.27 (8)	**.55 (17)	.40 (16)	.17 (12)
VE	H	.34 (19)	.34 (17)	*.51 (18)	.34 (14)	*.47 (19)
	NH	.41 (12)	.33 (8)	.35 (12)	.17 (9)	.27 (11)
	AMP	.20 (19)	.20 (8)	.14 (19)	.05 (18)	.25 (14)
AD	H	*.47 (21)	**.73 (12)	**.50 (20)	.34 (15)	**.61 (20)
	NH	.42 (17)	.31 (11)	.31 (11)	.25 (12)	.41 (16)
	AMP	*.39 (27)	.50 (9)	.50 (9)	.29 (26)	.22 (21)

*$p < .05$, **$p < .01$

(1) Word knowledge is related to VD and AD in all groups but is significant in both the AMP and SBH group, and it is also related to ME in the AMP. This indicates that word knowledge is highly dependent on decoding ability in the auditory and visual modalities for the SBH and AMP.

(2) Word discrimination is related to AD in the SBH group and to VD in the SBNH group.

(3) The ITPA subtests are differentially related to reading. In the SBH group reading is significantly related to VE and AD; while in the amputee group reading is significantly related to VD and ME.

(4) Arithmetic comprehension is related to VD only in the amputee group.

(5) VE and AD are significantly related to arithmetic problem solving in the hydrocephalic group. This relationship is not found in either the other two groups.

If we average the three reading tests to obtain an overall reading score and then relate this to the ITPA we find in the middle and oldest groups reading is differentially related to the subtests of the ITPA in the 3 disability groups. In the SBNH group and AMP reading is related to 3 Of 4 ITPA subtests, while in the SBH group reading is only related to one ITPA subtest.

Table 16: Relationship between reading achievements and ITPA Performance

	AD	VD	ME	VE
SBH	.75 (28)	-	-	-
SBNH	.57 (22)	.43 (24)	-	.63 (17)
AMP	.39 (27)	.59 (28)	.51(28)	-

Apparently in the SBNH and AMP groups in this age range (8-15), reading is related to the subject's ability to absorb, process, and "print out" information. There is a dissociation of these abilities in the SBH. (Table 16).

Our youngest (5-7) subjects were given reading readiness tests, and the interrelationships between the various processes involved in psycholinguistic competence and reading were examined. Table E1 (appendix) indicates the comparability of the two spina bifida groups in this age group, therefore for this analysis these groups (SBH and SBNH) were combined. If we look at those SB children who had a readiness score of C (average) or above, or D (below average) or below, it may be seen that of the 27 possible ITPA scores of those subjects with readiness ratings C or above only 4 are below 70; all the rest are 70 or above.

For those subjects receiving a readiness rating of D or below, of the 37 possible ITPA scores only 5 are above 70.* In the AMP the data looks similar. Of those AMP who had a readiness score of C or better, in 18 of 20 instances their ITPA scores were above 70.*

Of those AMP who performed at a D level or worse, in 10 of 25 cases their ITPA scores are 70 or below. If we change their criteria so that it remains at 70 for VD, ME and VE but increased to 120 on AD (A-C 120, D-E less than 120) then in those subjects who received a readiness rating of D or below, their ITPA scores were 70 (or 120) or below in 19 of 25 cases.

These data indicate that in the youngest age group there is a close relationship between reading readiness and ITPA performance. Interestingly, this relationship holds up in the two oldest age groups in the SBNH and AMP but not the SBH.

Our conclusions with regard to the relationship between ITPA and MAT differ slightly depending on the method of analysis. That is if we consider individual MAT subtests we observe one set of relationships (SBH: AD, VE; SBNH: NONE; AMP: VD, ME). If we combine the subtest of the MAT we find all the groups to be similar in their MAT readiness in that the ITPA is highly related to reading readiness. However, with age for the SBH only AD is significantly related to reading, while for the other groups other [illegible] are important.

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* Language age in months.

Chapter III: Intelligence

Summary: Analysis of intelligence testing indicates that the AMP are superior to the SBH in both verbal and performance intelligence while the SBNH group only exceeds the SBH group on the performance tasks. Furthermore the SBH group is more competent in the domain of the verbal tasks than in realm of the performance tasks. This verbal performance difference is not a function of IQ level. Interestingly, all groups start out at about the same level. Not only do the differences between the SBH and the other 2 groups increase with age, but the verbal-performance difference within the SBH group also increases with age. Test-retest performance of 39 spina bifida children indicates that when the group is examined as a whole, intellectual functioning is stable although there may be great within-subject variability.

Our study permits us to answer a number of questions concerning the intellectual functioning of children with spina bifida. These include the following: Are there differences in intelligence or patterns of intellectual function in the SBH, SBNH and AMP groups? Are the results on intelligence tests stable over time?

Differences Between and Within Groups

The basic findings on the means of verbal (VIQ), performance, (PIQ) and full scale (FSIQ) intelligence of the three groups may be seen in Table 17 and Figure 11. The findings indicate that verbal intelligence is higher than performance in all three groups but only in the SBH group is this superiority statistically significant (df 69, t=2.09, $p<.05$). The table also suggests that the SBH group is the most inferior and the AMP group is superior with the SBNH group falling in between. The difference between the SBH and AMP groups for the verbal scale (df 54, t=2.93) is significant at the .01 level, while the difference for the performance scale is significant at the .001 level (df=53, t=4.99). While the SBH group is inferior to SBNH group, this inferiority is significant only for the performance tests (df 58, t=2.68, $p<.05$).

TABLE 17

Means and Standard Deviations of the IQ Scores from the WISC

		SBH	SBNH	AMP
	N	35	28	21
VIQ	M	92.9	99.7	108.6
	SD	21.6	22.6	15.0
	N	36	24	21
PIQ	M	83.3	95.8	104.2
	SD	16.8	19.0	12.2
	N	37	24	22
FSIQ	M	91.0	96.0	105.8
	SD	15.5	19.6	14.7

Scatter Analysis of the Wisc

Jastak (1947, 1948, 1949a, 1949b) has developed a systematic approach to scatter analysis which combines the statistical sophistication of factor analysis with clinical experiences. This approach yields five scores - the altitude,(the average of the three highest scores which reflects a general factor (g) and four group factors). Language proficiency (the average of information, comprehension, similarities and vocabulary), reality contact or orthitude, (the ability to do the right thing at the right time, the average of comprehension, picture arrangement, picture complications, block design and object assembly), motivation (the average digit span arithmetic and digit symbol), and somatic efficiency (the average of picture arrangement, block design, digit symbol and information). Each of the four group factors is divided by the altitude and multiplied by 100.

The patterns yielded by this analysis reveals a profile for the SBH group which shows that relative to the altitude-linguistic proficiency is superior, reality contact and motivation are average and somatic efficiency is inferior-the pattern is similar to one found in brain damaged people. The SBNH group is superior in linguistic proficiency and reality contact inferior in motivation and average in somatic efficiency, a pattern which is similar to that found in neurotics(Whiteman, 1950). The AMP group is superior in all group factors except for reality contact which is average. The findings are summarized in the following table (table 18). In examining the Jastak approach to the WISC it is important to note that the group scores are relative to the altitude which is the same for all groups. Within Jastak's framework we might speculate that the intellectual capacities of all of our groups are similar (altitude) but that they differ in the group factors. However, this speculation is not testable in our current studies.

TABLE 18

Analysis of WISC According to Jastak's Approach

	Altitude	Language Polarity	Reality Contact	Motivation	Somatic Efficiency
SBH	10.3	98	82	83	77
SBNH	10.7	93	90	78	85
AMP	11.5	99	88	99	92

Changes in Intelligence with age

As we examine the changes in verbal and performance scores at different ages in our three groups (Table 19, Figure 12) a number of factors become visible: (1) The disparity between verbal and performance noted in the SBH group increases from a five point difference in the youngest group to an eighteen point difference in the oldest group. The latter is significant (df 22, t= 2.09, $p < .05$).

Table: 19 WISC Performance for 3 Age Groups

		VIQ	PIQ	FSIQ	Coeff. of Var. VIQ	 PIQ	 FSIQ
	N	7	6	6	170	160	172
	M	106.9	105.7	105.2			
SBNH 1	SD	18.2	16.9	18.6			
	N	11	10	10	186	224	160
	M	93.9	88.1	88.9			
SBNH 2	SD	17.5	19.7	19.2			
	N	11	9	9	291	196	214
	M	100.2	99.9	98.9			
SBNH 3	SD	29.2	19.6	21.2			
	N	7	8	7	114	168	136
	M	99.1	94.6	96.3			
SBH 1	SD	11.3	15.9	12.9			
	N	19	19	19	164	167	167
	M	94.2	84.9	88.5			
SBH 2	SD	15.3	14.2	14.2			
	N	12	12	12	213	267	245
	M	96.7	78.9	87.8			
SBH 3	SD	20.6	21.1	21.5			
	N	14	14	14	130	99	101
	M	106.3	100.7	104.1			
AMP 1	SD	13.8	15.4	14.6			
	N	17	17	17	122	101	101
	M	111.1	106.2	109.6			
AMP 2	SD	13.5	10.6	11.1			
	N	12	12	12	90	109	100
	M	105.1	100.3	102.8			
AMP 3	SD	9.5	10.9	10.3			

2) If we take a measure of the mean to the Standard Deviation (Coefficient of Variation = Standard Deviation x 100 divided by the mean Table 19) we may note differences between the groups. The higher the value the greater the variability of the group relative to its mean and the less stable is the measure. The AMP group is clearly superior to both SB groups. The AMP group has a median value of 101, SBNH has a median value of 186 and SBH has a median value of 167. The SBNH group appears to be the least stable. Furthermore while the AMP group appears to be more stable with increasing age both SB groups are less stable with increasing age. The possible reason for these findings in the SBNH group in particular will be touched on in a later chapter--Aspects of Schooling.

(3) All three groups function at about the same level at the younger age but differ in the older age. In the middle age group, for example, the AMP is superior to SBNH and SBH in both verbal and performance domains. In the oldest group both AMP and SBNH are superior to the SBH group in performance IQ ($p < .05$) but do not differ from each other.

TABLE 20

Jastak analysis of WISC by age in three groups

	Altitude	Language Polarity	Reality Contact	Motivation	Somatic Efficiency
SBH 1	10.8	81	84	93	84
SBH 2	10.0	91	82	83	78
SBH 3	10.3	91	81	75	68
SBNH 1	11.1	93	94	79	89
SBNH 2	10.2	95	84	76	81
SBNH 3	10.9	92	90	84	84
AMP 1	11.5	97	86	97	93
AMP 2	11.6	100	93	97	95
AMP 3	11.5	100	86	93	86

If we view the WISC results from the standpoint of Jastak's analysis (Table 20) we may note the following: (1) SBH group - as the children grow older the pattern moves in the direction of an "organic" style with the group factor scores marching in descending order from language proficiency, reality contact to motivation and somatic efficiency. (2) SBNH group - the findings do not show any clear cut drift with age except for the middle group which shows evidence of a neurotic style, by the dip in the motivation cluster. (3) AMP group - there appears to be no clear cut pattern, although we might interpret the dip in the reality contact cluster in the youngest and oldest groups as reflecting a withdrawal from interpersonal involvements.

Effects of levels of intelligence

We examined the intelligence test data in still another way. We divided our Spina Bifida children into four groups:

(1) SBNH IQ 90 or above

(2) SBH IQ 90 or above

(3) SBNH IQ below 90

(4) SBH IQ below 90

The results of such a data grouping are interesting (see table 21). There are no significant differences between the verbal IQ's of all the groups (+90 SBNH vs SBH, -90 SBNH vs SBH). In **below** 90 group the Performance IQ of the SBNH group surpassed that of the SBH group at a statistically significant level (df 24, t=2.40, $p < .05$). Furthermore, the Performance IQ of both groups of Spina Bifida Hydrocephalic children was below their verbal IQ. This Verbal-Performance difference was also of sufficient magnitude to reach statistical significance(+90: df 24, t= 2.12, $p < .05$; -90: df 30, t=3.25, $p < .01$). This indicates that the verbal performance difference which was reported for the entire group of Spina Bifida Hydrocephalic children exists for children with this disability regardless of their IQ level. This is not the case for the non-Hydrocephalic Spina-Bifida children.

Table 21: Means and Standard Deviations of those children with IQ's above and below 90

		SBNH			SBH		
		N	M	SD	N	M	SD
Below 90	VIQ	10	81.9	11.44	16	82.19	9.42
	PIQ	10	80.30	8.63	16	69.99	11.71
	FSIQ	10	78.5	7.67	16	74.56	9.15
Above 90	VIQ	17	112.12	15.33	13	108.00	12.28
	PIQ	17	106.82	14.81	13	98.31	11.02
	FSIQ	16	109.31	12.43	12	103.75	8.21

Test-Retest Data.

Since the SBH and SBNH do not differ with regard to test change in this particular substudy, they are combined. 39 Spina Bifida children were retested on the WISC at an interval of approximately 34 months after initial administration of the WISC (Table 22). Examination of table 22 indicates that although most scores increased there was only one subtest score, digit span, whose increase was of sufficient magnitude to reach statistical significance. In this instance both digits forward and digits backward increased from initial to subsequent testing. All the other subtests and the composites of verbal performance and full scale IQ's remained stable between testing intervals. Each of the subtest correlations except digit span forward testings is significant at less than the .01 level. Furthermore, analysis of the variability of each of the IQ's measures indicates the distribution of scores does not differ from the distribution that one would expect in a normal distribution.

Articles by Stott (1960, 1961) and Quereshi (1968) indicate that there are significant increases in IQ as a result of testing familiarity in populations of mentally sub-normal and normal children. Stott's studies, using both the Wechsler Intelligence Scale for children and the Terman-Merrill revision of the Stanford-Binet, throw into question both the Standardization and reliability of these two scales of intelligence.(Quereshi's and our subtest test-retest intercorrelations are compared in table E2).

Table 22: Test - Retest Means and Standard Deviation

Variable		Test 1	Test 2	$rt_1.t_2$
Full Scale IQ	N	39	39	.80(39)
	M	90.5	95.0	
	SD	16.7	18.5	
Verbal IQ	N	39	39	.78(39)
	M	96.1	99.9	
	SD	17.5	19.3	
Performance IQ	N	39	39	.83(39)
	M	85.9	90.3	
	SD	16.6	20.7	
Information	N	38	39	.67(38)
	M	9.3	9.7	
	SD	3.4	3.5	
Comprehension	N	3.8	39	.45(38)
	M	9.6	9.8	
	SD	3.7	4.0	
Arithmetic	N	37	39	.63(37)
	M	3.9	8.9	
	SD	3.3	3.6	
Similarities	N	37	38	.46(36)
	M	10.2	10.2	
	SD	3.3	3.1	
Vocabulary	N	25	23	.50(17)
	M	9.8	10.8	
	SD	3.0	4.2	
Digit Span *	N	30	37	.77(29)
	M	8.8	10.8	
	SD	3.6	4.0	
Picture Completion	N	39	39	.41(39)
	M	9.8	9.9	
	SD	2.5	3.0	
Picture arrangement	N	33	38	.62(32)
	M	7.9	9.1	
	SD	2.7	3.9	
Block Design	N	39	39	.74(39)
	M	8.0	8.2	
	SD	3.3	3.6	
Object Assembly	N	37	38	.55(36)
	M	3.9	3.7	
	SD	3.7	4.6	
Coding	N	32	35	.60(28)
	M	6.3	6.9	
	SD	3.1	3.8	
Digit Span ** Forward	N	26	32	.46(25)
	M	4.7	6.09	
	SD	1.1	1.4	
Digit Span *** Backward	N	26	32	.61(25)
	M	2.9	4.2	
	SD	1.7	1.5	

* df 65 t= 2.13, $p < .05$

** df 56 t= 4.16, $p < .001$

*** df 56 t= 3.09, $p < .01$

(The similarities of the correlations are noteworthy). Contrary to these findings, our data are consonant with those of Throne (1965) and Gehman and Matyas (1956), who confirm the test-retest reliability and stability of the WISC. Their findings were obtained in samples of mental retardates. One can explain the differences obtained in our study and those obtained by Quereshi by indicating the normal attributes of Quereshi's population as opposed to our own. (Table E_2). Furthermore, Quereshi retested his sample at a much shorter interval (3 months) than we did. It is more difficult to account for the results obtained by Stott since the factors of both attenuation and regression should be operative in both samples.

The means and standard deviations do not adequately represent the amount of change than an examiner may encounter upon retesting a spina bifida child. Table 23 represents the amount of change we found in individual cases grouped in 5 point intervals (testing 2-testing 1). Table 23 indicates that it would be within the realm of expectation to receive as much a 20 point change in IQ in about 15 per cent of the cases.

Table 23: Amount of change from testing 1 to testing 2 in points in WISC Perf.

	-20	-15	-10	-5	0	+5	+10	+15	20+
Verbal IQ	1	1	4	10	6	7	1	3	6
Performance IQ	2	2	3	14	3	4	2	6	3
Full Scale IQ	0	1	7	8	6	3	6	5	3

When testing is performed at about a 3 year interval, there appears to be a slightly greater percentage of cases at the positive end of the above continuum than at the negative. It is not possible to say whether or not the differences found are the results of increased test familiarity regression toward the group mean or a general change in competence. If however the results were just due to practice effects it would be expected that there would be more change in PIQ than VIQ. This is not the case.

Relationship between Achievement and Intelligence

Table 23A: Correlation between Achievement and Intelligence Partialing Out Age

	Arithmetic			Reading		
	VIQ	PIQ	FSIQ	VIQ	PIQ	FSIQ
SBH	.21	-.21	.04	.10	-.27	-.05
SBNH	.64**	.42*	.50*	.68***	.54**	.60**
AMP	.41*	.68***	.57**	.53**	.64***	.63***

*p $< .05$, **p $< .01$, ***p $< .001$

Table 23A clearly indicates that the expected association between achievement and intelligence are found in the SBNH and AMP groups. This however is not the case in the SBH group. These data suggest a disassociation between the competences involved in these two domains in the SBH group.

Chapter IV

Verbal Associations in Children with Spina Bifida

Summary: When presented with verbal free association tasks to four stimuli (animals, people, jobs, leisure) we found that in all groups the animal category produced the most responses and leisure the least. For the SBH animals exceeded people and jobs but not for the SBNH and AMP. All the associations tasks are related to each other and are highly related to reading for all groups, but the groups show differential relationships between association tasks and ITPA. The skills involved in digit span backwards and in vocal encoding are correlated differentially to associations in different groups.

The study of verbal associations in children with spina bifida was conducted for a number of reasons. In a previous study in our program we had noted that the speech of SBH children was more irrelevant than that of those with SBNH even though both groups were similar in verbal intelligence. Indeed it was puzzling to note that the SBH children differed in performance intelligence, rather than verbal intelligence and had difficulties in learning sequential tasks such as those taught in physical therapy. Furthermore their parents tended to report being confused by their children who were described socially as bright, facile, superficial, driven and anxious. This constellation of adjectives used to describe their social behavior being similar to the way in which one would describe cocktail party behavior, (Diller, et.al. 1966). We puzzled over our findings because this kind of behavior has been rarely described (Taylor 1961), despite the fact that hyperactivity has been well described and extensively studied. We therefore thought that the verbal associative habits of the speech of SBH children merited more intensive examination.

We might note the study of Fleming (1967) which reported findings similar to ours in that SBH children are said to be "egocentric" and aggressive in their speech habits. From a theoretical standpoint the study of egocentric elaborations has been neglected by current students of sociolinguistics and child development (Cazden 1968) who are concerned with socially disadvantaged children. Bernstein (1962), for example, argues that lower class children use restricted codes of speech while middle class children use elaborated codes of speech. While the elaborated codes of speech involve egocentric sequences such as "I think" or " I mean" the thrust of their studies has been to look more intensively at the restricted codes of speech.

While language styles have yielded important clues to mental functioning in children with spina bifida, another path of work suggests that verbal association samples might offer a useful way to examine the mental life of children. Free associations for example, form the methodological base of psychoanalysis and help define its primary rule "say whatever comes to mind". This insight has been utilized in projective tests e.g. word association measures, and in literature (stream of consciousness novel). In experimental psychology, Bousfield and his associates have studied association samples in different clinical populations including brain damaged and retarded adults (1953), while many students of experimental psychology have been immersed in studying the conditions and patterns of associations (Melton, 1964, Jenkins 1958).

Since one important dimension of associations as reflections of mental processes is the sheer output of them (a factor particularly pertinent to the clinical impression of the SBH children as hyperverbal, Diller, et.al., 1966) our association tasks were designed to be open ended and more responsive to the emissions of the subject rather than the particular stimulus conditions set by the examiner. Verbal productivity is not only an important indicator in deprived people, but also in creative ones at the opposite end of an elaboration continuum (Gray 1969). Productivity of associations may be an important underlying component of serial behavior (Lashley 1957) and the study of the associations may furnish clues with regard to the sequential organization of behavior (Bryden 1967). Association tasks are particularly pertinent in the study of brain injured children, since more classical tests for the brain injured are not primarily verbal, Many are derived from experimental work with animals.(Kleuver, 1933).

Association topics were also selected to reflect different facets of mental life. For this reason four association tasks were chosen. The first was chosen as a buffer to provide initial baseline of association competence in an area familiar to children - animals. The other tasks reflected content areas whose relevance to our concern will be discussed in more detail in a later section - interpersonal recall, jobs, and leisure time activities.

For each of the four content areas the child was asked to name as many (animals and jobs, he could think of, as many people he thought of or talked to during the previous 24 hours and as many leisure activities in which he had participated) as he could, only the first 15 responses were counted.

The results will be presented to answer the following questions. (1) Are there differences between content areas (animals, people, jobs, leisure) in terms of number responses elected by each category? (2) Are there differences between groups of disabled children in terms of number named? (3) How do content areas relate to each other? (4) How does response to association (or recall) tasks correspond with academic attainment? (5) How do content areas relate to WISC and ITPA for different groups of disabled children? (6) How does content relate to some correlations in naming and vocal encoding? Thereafter we will consider in more detail some further issues relevant to animals, interpersonal recall and jobs.

Differences Between and Within disability groups and content areas.

Table 24: Number of Associations in different groups of disabled children

	SBH			SBNH			AMP		
	M	SD	N	M	SD	N	M	SD	N
No. of animals	9.9	3.8	42	10.6	4.0	29	11.1	3.9	51
people	7.8	3.6	44	8.8	4.2	32	10.8	4.9	53
jobs	6.9	5.4	43	9.4	4.3	29	9.8	4.7	52
leisure	4.3	2.5	42	6.0	3.8	29	6.7	3.1	52
Vocal encoding	75.5	23.0	28	102.1	27.7	17	105.5	22.2	19

Table: 25

INTERCORRELATION OF FIVE NAMING TASKS

SBH

	Animals	Leisure	Jobs	VE
People	**.40(44)	**.41(42)	.28(43)	.02(31)
Animals		*.32(39)	**.69(40)	.08(28)
Leisure			**.58(42)	.12(30)
Jobs				.19 (31)
VE				

SBNH

	Animals	Leisure	Jobs	VE
People	**.62(29)	*.41(29)	**.65 (29)	.11(17)
Animals		*.59(27)	**.69 (29)	**.63(16)
Leisure			**.71 (29)	.37(17)
Jobs				.38(17)
VE				

AMP

	Animals	Leisure	Jobs	VE
People	**.51 (52)	**.48(52)	**.51(52)	.13(19)
Animals		**.33(49)	**.49(49)	**.61(18)
Leisure			**.63(52)	**.67(19)
Jobs				*.48(19)
VE				

** $p < .01$
* $p < .05$

A glance at Table 24 suggests that for all groups, animals produced the largest number of responses and leisure produced the least number of responses. For each group the difference between the number of animals and the number of leisure activities was highly significant ($p < .001$) with t's ranging from 4.53 to 6.29. For the SBH group animals exceeded the number of people ($df = 86$, $t = 3.61$, $p < .001$) and number of jobs ($df = 83$ $t = 3.02$, $p < .001$) at highly significant levels. However for the SBNH and AMP groups, the superiority of the number of animals to the number of people and jobs was clearly within the limits of chance.

How do Naming tasks relate to each other?

Is response to the association tasks a unitary trait or is it content specific for the different disability groups? An examination of Table 25 indicates that, on the whole, performance on the naming tasks are related to each other, with 17 of the 18 correlations being significant at the .01 level. It should also be noted that the correlation for the SBNH and AMP groups are higher than for the SBH group.

How do Naming tasks relate to reading ability?

With regard to productivity of associations there is one very important finding which emerges from the data. The association tasks are highly related to reading ability in all of the groups. This may be seen in the following table (26).

Table 26 : The Relationship between Reading Ability and Productivity on the four Naming tasks

	SBH	SBNH	AMP
	r (n)	r (n)	r (n)
No. Animals	**.60 (31)	**.57 (26)	**.73 (40)
No. Leisure	*.38 (33)	*.43 (27)	--
No. Jobs	**.71 (34)	**.45 (27)	**.47 (41)
No. People	---	**.53 (28)	**.50 (41)

These correlations take on additional interest in view of the fact that they are on the whole higher than the correlation between verbal intelligence and reading, which is significant only for the SBNH group in our study ($r = .54$, $n = 27$, $p < .01$), and compare favorably with the results obtained in correlating ITPA with the achievement tests. This raises the question - what does productivity of associations measure?

The Relation of Naming to Intelligence and Psycholinguistic Ability

Examination of the correlates of the naming tasks with the Wisc and ITPA subtests might shed some light on the factors involved in number of associations. With regard to the Wisc it is of interest to note that on the whole there appears to be little relationship to WISC competence (except for jobs, which will discuss later). Digit span backwards might be an exception to this generalization. Success on DSB* appears to be related to the number of people in the SBH group, the number of animals jobs, leisure in the SBNH group, and the number of jobs in the AMP group. It is therefore associated with the naming tasks in 6 of the 12 possible comparisons. We might suggest therefore that one of the abilities which is related to productivity is an ability to maintain a sequence in the correct serial order, even when an additional mental operation (keeping the digits in mind as they are being reversed) is required. The suggestion takes on some plausability when it was noted that DSB is significantly lower than digit span forward (DSF) in the SBH group when compared with the AMP group ($X^2=25.7$, $p<.01$, df=4) and the SBNH group ($X^2=20.0$, $p<.01$, df=4).

In comparing the ITPA correlations of the number of associations to the different tasks in the different groups, we find complex intercorrelations which defy easy generalization (table 27). However, some statements can be made (a) In the SBH group AD is related to naming of animals and number of people. (b) The SBNH group is very similar to the AMP group for animals and people but not for jobs and leisure. We might therefore conclude--that the psycholinguistic skills which are pertinent to productivity of names depends on the disability group and the specific category of associations. Thus the SBNH and AMP may be more similar in the patterns of skills which are associated with naming than either is to SBH.

Table 27: Significant ITPA Correlations for different Naming Categories in Different Disability Groups

	Animals	People	Jobs	Leisure
SBH	AD	AD	-	-
SBNH	VD, ME, VE	AD, ME	VD	-
AMP	VD, ME, VE	ME	-	VD,ME, VE

Some Correlates of Naming and Vocal Encoding

Is naming related to vocal encoding? That answer depends on which disability group is under consideration. In the SBH group VE is not related to any of the 4 naming tasks. In the SBNH group it is only related to animals. In the AMP group it is related to 3 of the naming tasks. We might therefore note that VE, which is defined as an ability to express an idea in words, but more operationally, as an ability to describe objects accurately and relevantly, is related to productivity of associations in the non brain injured group but not in the brain injured group. The dissassociation in the SBH group is of interest. For instance, we might argue along with Maier and Schneirla (1964) and Birch and Bortner (1967) that there is a distinction between possessing an ability and using it. Brain injured children might therefore be able to offer names, but cannot utilize names in a meaningful way. However, we should also note that the disassociation here is between different abilities and not between abilities and their use. Data for this paragraph are presented in Table 25.

* Digit span Backwards.

Chapter V

Verbal Association in children with spina bifida (further analysis of the animal task).

Summary: The number of animals does not distinguish between groups but it does between ages. Some differential correlates of animals are presented along with the development of a measure--the number of common animals.

The fact that the number of animals named does not differ significantly for the three groups and that this lack of difference is not due to a constraint of a ceiling effect specific to the task suggests that animals may serve as a baseline association task which is not impaired by the presence of brain damage and for the SBH group there is a selective lag in the people and job tasks. It may be of interest to note that the number of animals is correlated with the vocal encoding task of the ITPA for the SBNH and the amputee groups. In other words the number of animals named is related to the ability to express an idea in words. This is not the case in the SBH group.

Relationship between animals and age

At this point we might note a consistent rise in the number of animals named with age in each of the three groups, but a fair degree of consistency between all groups of disabled children within an age level.

Table 28: Number of animals in different age groups according to disability

	SBH			SBNH			AMP		
	M	SD	N	M	SD	N	M	SD	N
Youngest	6.5	3.3	11	7.0	3.77	10	7.6	3.0	20
Middle	10.2	2.8	15	12.3	4.6	9	13.5	3.0	14
Oldest	13.3	2.9	14	14.4	5.3	11	13.4	2.2	17

↕INDICATE DIFFERENCE BETWEEN GROUPS AT .01

The number of animals named appears to be related to age. This relationship is significant for SBNH (df 29, $r=.49$, $p < .01$); it falls short of significance in the other groups because of the ceiling effect. In the oldest groups the number of animals may therefore be regarded more as a measure sensitive to the effects of age rather than to the effects of disability.

Naming Animals

The number of animals also lends itself to additional indices. We determined both the number of and the percentage of common animals.

We arrived at this measure by setting up frequency tables for each animal which was listed for all of the subjects in our study. An animal which was listed in more than 15 per cent of the cases was tabulated as a common animal. The number and percent of common animals were similar for all three groups. (table 29). Thus the production of common responses is not affected by disability.

Table 29: Number and Percent Common animals

		SBH	SBNH	AMP
	N	42	29	49
Number Common	M	6.07	5.90	6.12
	SD	2.50	2.24	2.81
	N	42	29	49
Percent Common	M	63.88	60.67	58.35
	SD	17.94	23.66	21.74

Examination of the correlates of animals indicates that in all three groups jobs and total number of people are highly related to animals. In the SBNH and AMP groups VE and Leisure are also highly correlated with animals.

Table 30: Correlates of Naming Animals

	Total	Jobs	Leisure	AD	VD	ME	VE
SBH	**40(42)	**.69(40)	NS	** 57(31)	NS	NS	NS
SBNH	**.62(29)	**.69(27)	**.59(27)	NS	**.61(25)	**.69(15)	**.63(15)
AMP	**51(51)	**.76(51)	**55(51)	NS	**.49(27)	**.68(16)	**.61(18)

**p < .01 *p < .05

Looking at the relationship between the ITPA subtest and animals it is apparent in the SBNH and the Amputees animals is related to both encoding and decoding ability. This is not the case in the SBH group. (table 30). This task appears to be tapping the tendency toward optimal production in the SBH group. Apparently in the SBNH and AMP this is more of a decoding and encoding task, which taps the VD and ME systems.

Some correlates of the number of common animals may be of further interest. For the SBH children (df=18, r=.50, p < .05) and the AMP children (df=45, r=.31, p <.05) the number of common animals is related to living in the suburbs vs living in New York City. While all groups show a relationship between the number of common animals and the number of animals, this relationship is higher in the SBH group. (SBH-df=40, r=.76, p <.01), SBNH-(df=27, r=.50, p <.01), AMP-(df=47, r=.59, p <.01).

Chapter VI

Interpersonal Recall in Spina Bifida

Summary: A technique using interpersonal recall and the method of stimulus equivalents reveals that the number of names is sensitive to the effects of age, disability and social class in non disabled children. Naming both peers and family is related to flexibility on the Goldstein Scheerer test. The number of equivalencies is related to the number of people in all groups but it is correlated with different patterns of abilities in each of the disability groups.

In this particular subsection, we are concerned with the interpersonal recall of children with spina bifida. This concern may be approached from any one of the following frameworks - cognitive development in brain damaged children, social psychology or personality theory.

From the standpoint of cognitive development in brain injured children, it is noteworthy that students in this field have concerned themselves with the ways in which brain injured children solve problems involving objects and/or ideas. While this may be readily understandable in the case of those who are concerned with school achievement and intelligence testing, it is even true of Heinz Werner, who was a pioneer in elucidating the cognitive processes in child development and in children with brain damage (Diller and Birch, 1964), and Lauretta Bender, who was concerned with emotional problems of brain injured children (Bender, 1956). Yet the social immaturity of brain injured is readily apparent in the clinical reports of observors who come into contact with these children when they grow up (Wortis and Cooper, 1954, Taylor, 1959).

The problem of the interpersonal perceptions of handicapped children has also received some impetus during the past decade from the work of several groups of social psychologists. Roger Barker (1963) and his students have pointed out that handicapped children are not only exposed to fewer environmental settings but also engage in fewer encounters with people. In another context, Richardson has pointed out that the handicapped child receives a different style of interpersonal feedback from other people. Non-handicapped people, in brief social encounters, tend to assume distant, non-critical roles (Kelly 1967; Gofman 1963). This provides the child with less differentiated interpersonal stimuli, so that we might expect that a child with a visible physical handicap is exposed to flattened interpersonal encounters. The way the child pictures people is, therefore, affected not only by the distortions of his cognitive apparatus, but also by the distortions based on actual experiences or lack of experiences.

Recent work in personality theory provides still another framework for considering the interpersonal perception of handicapped children. Over a decade ago, impetus for these endeavors was provided by the volume on

Interpersonal Construct Theory of George Kelly (1955). The ways in which the child construed people appeared to be a neglected but needed area for further study. One major concern was a methodological one - how can one measure this in a reliable way. Among the suggested approaches are the notions of spatial scheme of De Soto (1962), Kuethe (1962), Feffer (1967), and Weinstein (1967). A second approach which was developed to test Kelly's theory via the Reptest has been recently reviewed by Bonarius (1965), and Bieri (1955). The spatial scheme approach when applied to a population of children with known visuo-spatial impairments, such as in our population of children with hydrocephalus, may be influenced by the fact of the impairment. The Kelly test might lose some sensitivity because it is structured in the sense that the stimulus figures are provided to structure the task. This factor has recently been demonstrated by Bannister (1965). The technique does not make full use of the child's own categories for encoding people (Hastorf, Richardson and Dornbush, 1956). However, the insights provided by the Kelly test can be further enhanced by two other approaches which have been found to be useful in trying schematize how people construe their worlds. In one method, as exemplified in the work of Tyler and Sundberg (1965), it has been shown that when children in different cultures are simply asked to list the most common jobs that they can think of, the jobs listed by the children in the United States differ from those listed by children in the Netherlands. These differences suggest a method which is sensitive to the ways in which children construe employment. A second method which has been used in the study of children (Birch and Lefford, 1964, Blank and Bridger 1966, 1968) and animals (Kluever, 1933), is the method of equivalent stimuli, which has been suggested as a useful tool for the study of personality (Kluever, 1933). The listing of people, in accordance with Tyler and Sundberg (1965), combined with the method of equivalent stimuli, would then provide a useful tool for arriving at a picture of the ways in which people are construed and categorized. Indeed, to paraphrase the line of logic pursued by Kelly in his search for interpersonal construct, one might argue that the pattern of a child's interpersonal complexes is defined by the pattern of his interpersonal stimulus equivalents.

Because there is so little formal research in this area, we are not in a position to pose hypotheses for testing. We can ask a number of questions; Do handicapped children construe their interpersonal environments differently from normal children? Does the interpersonal environment differ with age, social class, presence of brain damage?

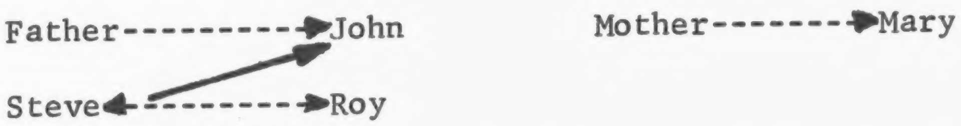
In addition to the populations used up to this point in the study we were able to obtain access to a public school at the borders of Harlem with a large sample of middle class white children and a large sample of Negro and Puerto Rican children. We examined 30 white children, 30 non-white children, 5 in each of the first 6 grades.

All groups of children received the People task and the Goldstein Scheerer color form sorting test. For the non-handicapped children, group tests of intelligence and school achievement were available from the school records. In addition, data on the number of jobs and leisure activities were also available, for the normal children. Due to the difficulty of categorizing these data, only the total number of responses were available. Furthermore, it was clear that the white children came from middle class homes, while the Negro and Puerto Rican children came from lower class homes.

For the remaining groups, the following measures were available - WISC, MAT, data on social class and ethnicity in addition to the Goldstein Scheerer test, the number of jobs, leisure activities and number of animals which the child named.

The responses to this task yielded a number of scores.

1. Total number of people named.
2. Total number of family, peers, other adults, animals and myself.
3. Patterns of linkages which included:
    (a) Total number of clusters or complexes. (A complex is defined as all names which are associated with each other). A child who says my father makes me think of John. John makes me think of Roy. Roy makes me think of Steve. Steve makes me think of John and my mother makes me think of Mary, offers six names and two complexes which may be schemetized as follows:



    (b) Types of linkages such as single link-John ------→Roy, mutual link - Jim←------→Bob, single chain John---→Roy---→Steve, mutual chain John←-----→Roy←-------→Steve.

4. In addition, central people e.g. in the above example John is the central person because more answers are directed toward him than to the others and central concepts "Because he is nice," "Because he talks a lot," " Because he is bossy," can also be enumerated.

General Analysis of Interpersonal Recall

Table 31: Comparisons of Number and Types of People in 3 Groups of Children, SBH, SBNH, AMP.

	SBH			SBNH			AMP		
	M	SD	N	M	SD	N	M	SD	N
Total	7.1	3.6	44	8.8	4.2	32	10.8	4.9	53
Family	2.7	2.2	44	2.4	2.2	32	3.4	2.9	53
Peers	3.0	3.6	44	3.7	3.2	32	6.1	3.8	53
Adults	1.6	1.8	44	1.9	2.7	32	.74	1.2	53

The findings indicate that the naming of people is a function of type of disability in the case of handicapped children (table 31). For example AMPs name more people than SBH (df 95, t=4.22, $p < .01$).. It is of interest to note that all the groups named about the same number of family members, but differed in number of peers (AMP vs SBH- df=95, t=4.1, $p < .001$), AMP vs SBNH (df=83, t=2.99, $p < .01$), and adults.

Another way of viewing this effect may be found in comparing the per cent family and peers of the total number of people offered (Table 32.)

Table 32: Percent of total people in family or peer category

	SBH	SBNH	AMP
Family	38	28	31
Peer	41	42	57
Adults	22	21	7

In general the greater number of peers, the greater number of people named with r's ranging from, .60 to .74.

Due to the complex nature of the various linkages used to analyze this task and their concomitantly complex arrays of correlates we will only discuss the content of responses, where the data is interpretable.

Our data indicates that the number of people responses is affected by disability. At this point we may raise the question as to whether or not social class factors influence responses to the task. While we examine the social correlates of responses to our tasks elsewhere in this report, the effect of social class variables in a group of non-disabled children on this task was thought to be of interest for a number of reasons. First, it would appear to be intrinsicly relevant to the demands of the task. Second, this task is a novel one which has never to our knowledge been administered to a non-handicapped population. The inclusion of this population would add some knowledge of the parameters of the task. In addition we could pose the question as to whether or not the SBH group resembled lower class or upper class children in their performance patterns.

As previously stated we were able to study a sample of non-disabled children, in a public school in New York City. Since this substudy was conducted early in the project when our techniques had not been fully explored there was a slight variation in the construction of the naming of people task in that a limit of 15 was not placed on each subject. Although some subjects offered more than 15 names this was utilized as the ceiling on productivity. In each case we only evaluated the first fifteen responses.

We found that lower class children (LC) offered less responses (M= 10.6, SD=10.5) than the upper class children (M= 12.2, SD=18.0). (table 33). Due to the high standard deviations, we examined each of the distributions of scores in each of the three age groups found in grades 1-2, 3-4, and 5-6 and found that the variability was great in all grades. For this reason we will examine the cells(subgroups)by age using medians.

Table 33: Trends in Number of People in 5 groups at 3 age levels(medians)

	SBH	SBNH	AMP	LC	UL
	(N=43)	(N=32)	(N=53)	(N=30)	(N=30)
Youngest	6.5	5.0	7.0	6.5	12.0
Middle	5.5	8.5	13.0	11.6	12.5
Oldest	10.0	12.0	14.5	8.3	12.0
Grand Mdn.	6.5	8.5	10.5	10	12.3

Since 10 names is close to the grand median for the entire sample, we might better appreciate the trends in the data by noting the percentage of subjects who offered 10 or more names.

Table 34: Percent of children by Age, Disability, who offer 10 or more names

	SBH	SBNH	AMP	LC	UC
Youngest	15(13)	22(9)	29(21)	20(10)	70(10)
Middle	0(14)	10(10)	63(14)	60(10)	60(10)
Oldest	50(16)	77(13)	67(18)	40(10)	80(10)
Total	23(43)	42(32)	51(53)	40(30)	70(30)

As table 34 indicates, more UC children offer 10 or more names than any other group. Furthermore, the superiority of the UC children is most marked in the youngest children when compared with the other groups of children. The SBH children clearly show the greatest lag in that fewer than one-fourth offer 10 or more names. The AMP and LC children resemble each other in that the youngest groups show a lag which is overcome by the two elder groups it recurs in the oldest LC's while the SBH and SBNH are quite similar in that the low frequency of names persists until the oldest group. The number of names offered is therefore sensitive to age and to the particular group which the child belongs.

In examining the interplay between the types of people named and the different disability groups we could divide the people into 3 categories family, peers and adults (non family). Other categories were not mentioned frequently enough in order to warrant statistical consideration, Although responses such as God, me, dog,occur infrequently, we might argue that a well balanced string of associations includes a sample of family and a sample of peers. In general, family and peer relationships represent given facets of life's major enterprises. This would be consonant with the classical thinking of a long list of eminent philosophers and psychologists who have suggested that successful mental functioning incorporates two dimensions of attitudes love and work (Neff, 1969). Therefore we might consider children who combine both family and peer in a separate category on the grounds that these children are able to reflect dimensions of attitudes related to love and work. When we divide our groups into types of people using these notions, we obtain the following results.

Table 35: Primary types of People Named by different Disability groups

	AMP	SBNH	SBH	LC	UC
Family & Peer *	31	11	12	12	18
Family	8	6	8	9	4
Peer	10	7	5	16	5
Adult	0	5	14	3	3
	49	29	39	30	30

* Family & Peer - at least 2 family and 2 peer.

Table 35 presents three striking findings: a) The AMP group mentioned at least 2 peers and 2 family in 62% of the cases and UC mentioned this constellation of people in 60% of the cases. This is in sharp contrast to the LC, SBNH and SBH groups who only mentioned 2 peers and 2 family in 40%, 28% and 30% of the cases respectively. b) Between 15 and 20 percent of the subjects in all groups list either family or peers but not both. c) The SBH group lists 35% adults, while the SBNH and LC lists 17%, the UC lists 14% while the AMP group lists no adults.

Why should the AMP and UC groups list more of both family and peers? A simple explanation is that the listing of both categories requires some degree of mental flexibility, i.e. the ability to shift from one train of thought (family, peers) to another (peers, family). We were able to test this explanation in a direct way. Since our subjects received the Goldstein Scheerer test, we reasoned that those subjects who were flexible associators would respond more to the form than to the color dimensions of the task; such a finding would be in accord with the developmental studies of (Saarinen,1964) A simple 2 x 2 comparison between type of people named and use of form vs color revealed our hypothesis to be correct in 69 per cent of the SBH group (N=33), 68 per cent of the SBNH group (N=24), and 80 per cent of the AMP (N=43). All of these comparisons are significant at the .05 level. When we combine our three groups we find our hypothesis correct in 70 per cent of cases (N=100). A similar figure is obtained for the non-disabled groups. It is of interest to note that the prediction is more powerful in one direction than in another. Of 33 people who offer color responses 24 per cent say family and peers. While of 67 who offer for responses two-thirds offer family and peers. For the non-disabled children a similar finding occurs. For both UC and LC 24% who choose color, mention family and peers while 57 per cent who produce form produce family and peers.

An equally puzzling problem which arises is to try to explain why the SBH group should list more adults than the other groups--two explanations present themselves. First it may be that more of the SBH group children were inpatients in the hospital setting at the time they were studied, so that the questions "Tell me all of the people whom you talked to or thought about yesterday....." would of course tend to elicit more responses related to hospital personnel than to family. However,

TABLE 36

People, Peers and Family in Three age groups

Variables

		Total People	Number Peers	Number Family	% Peer	%Family
SBNH 1	N	9	9	9	37	45
	X	6.2	2.3	2.8		
	SD	3.5	3.2	1.6		
SBNH 2	N	12	12	12	41	34
	X	8.7	3.6	3.0		
	SD	2.7	2.4	2.8		
SBNH 3	N	11	10	10	49	11
	X	10.6	5.2	1.2		
	SD	4.7	3.8	1.4		
SBH 1	N	14	14	14	41	46
	X	5.9	2.4	2.7		
	SD	4.0	3.2	2.7		
SBH 2	N	18	18	18	40	38
	X	7.1	2.8	2.7		
	SD	3.3	3.7	2.1		
SBH 3	N	12	12	12	47	33
	X	8.9	4.2	2.7		
	SD	4.1	3.9	2.1		
AMP 1	N	19	19	19	64	28
	X	8.0	5.1	2.2		
	SD	4.1	3.5	2.3		
AMP 2	N	16	17	17	45	41
	X	12.8	5.8	5.2		
	SD	4.4	3.6	3.5		
AMP 3	N	18	18	18	64	25
	X	12.1	7.7	3.0		
	SD	4.9	4.2	1.8		

no evidence exists that this was the case, since outpatient children named school personnel in lieu of hospital personnel. A second explanation might be that SBH children substitute other adults for parents. For example both groups of SBH children mention mother in 50 per cent of the cases, while the amputee group mention mother in 68 per cent and the non-disabled children mention mother in 74 per cent of the cases. Even more striking is the fact that mother is considered central to a complex in about half the amputee children, one-third of the SBNH and one-sixth of the SBH children. Several alternate reasons seem plausible to account for this finding although they are not presently testable. These include (1) SB children offer other adults out of a perceived social desirability effect i.e. they think of the examiner as another adult and offer names in accordance with this set or (2) Attitudinally, SB children may have diffused feelings toward parents and parent surrogates.

How does the response to the task change with age?

The number of family responses decreases in the SBNH group ($SBNH_1$ vs $SBNH_3$ (df=17, t=2.33, $p < .05$) while remaining about constant in the SBH and AMP groups. On the other hand, peers tend to remain constant in the two spina bifida groups, however there is an increase in this type of response in the AMP (AMP_1 vs AMP_3, df= 35, t= 2.05, $p < .05$) (Figure 14) (Table 36).

Furthermore there is an indication that in the SBH group there is a lag in the number of peer responses when compared with the AMP. (SBH_1 vs AMP_1, df= 31, t= 2.27, $p < .05$; SBH_2 vs AMP_2, df= 33, t= 2.43, $p < .05$; SBH_3 vs AMP_3, df = 28, t= 2.30, $p < .05$).

It might also be noted that although the differences between the UC and LC in the number of people named are insignificant, the UC names significantly more peers (df= 58. r= .36, $p < .05$) and adults (df= 58, r=.30 $p < .05$).

In comparing the changes in names of different kinds of people in each of our groups we may note three points of interest. First the number of family tends to be constant through all ages and all groups. Second the number of peers is greater in the UC than in the LC and more than in the groups of disabled children. Third while the number of peers is relatively stable for children at different age levels in the UC, this is not the case for lower class children where there is fluctuation from one group to another and in the disabled children where there is an increase in peers with age.

How are the names organized in relation to each other?

With regard to the clusters which bind the names together, several findings should be noted. The number of clusters appears to be related to the total number of people (r's = .60 - .70) and the number of peers (r= .35-.40). In the AMP group the number of clusters is related to number of family (r=.38 n= 56, $p < .01$)

The correlates of the number of clusters yield differing kinds of mental abilities for the different groups. For example in the SBH group the number of clusters is related to performance intelligence (df= 36, r=.44, $p < .01$) and 3 of the individual scales on the performance section, picture completion, picture arrangement and block design. The correlations are of interest since these tests are particularly sensitive to field dependence in non-neurologically impaired people (Witkin, 1954) and would be in accord with the notion that interpersonal complexes are related to the ability to overcome the distracting effects of a field--a quality alleged to be measured in these particular tests. An analogous situation has been shown for brain injured adults where hemiplegic individuals are similar to field dependent normals (Diller and Weinberg, 1962). In the SBNH group, the number of clusters is related to school achievements (reading df=24, r=.43, $p < .01$) and arithmetic (df=23, r=.35, $p < .05$) and verbal intelligence (df=27, r=.38, $p < .05$) and digit span forward (df=12, r=.57, $p < .05$) and backward (df=12, r=.53, $p < .05$). The number of clusters is therefore related to two major abilities in the SBNH - one is verbal ability and the other is serial reproduction or persistence. In the AMP group, by way of contrast, the correlates of clusters which are significant are reading (df=39, r=.41, $p < .01$) arithmetic (df= 38, r=.45, $p < .01$) and digit span backward (df =38, r=.34, $p < .05$), so that the correlates of the clusters for the amputees overlaps the other groups but does not involve the performance abilities which are relevant for SBH and the verbal abilities which are relevant for SBNH. It is of further interest to note that the number of clusters is related to reading (df=58, r=.40, $p < .05$) and arithmetic (df=58, r=.32, $p < .05$) in both UC and LC combined (they did not differ in this respect). The findings for all the groups with regard to the correlates of number of clusters may be pictured in accordance with the following diagram(Figure 15).

Clusters of People

We may view the cluster or complexes of equivalencies of people as ways in which the subject imposes his own categories on his own stream of associations. While there are no studies using the method (to our knowledge) in the literature a number of analogous studies are relevant. For example, Schutzman and Strauss (1955) analyzed the descriptions of a cluster by people of different social classes. They found that lower class people described the disaster from their standpoint and in relation to their own activities while middle class people respondents described it from several points of view. Campbell and Radie-Yarron (1956) analyzed the perceptual categories used by children in describing other people. In a sense we might regard our clusters as the subjects own system of categorizing.*

In concluding this chapter we may note that the interpersonal recall task yields interesting information on the phenomenology of the child's interpersonal environment. Clinically we have discovered that this task taps a rich stream of mental content which is generally by passed when other tasks are utilized. While our method of scoring this task only taps some of its dimensions, it has proved to be sensitive to both similarities and differences between disabled children, children of different ages, and children of different social class. The teachers to whom we presented our findings were extremely interested in the raw protocols.

* Appendix E_3 contains a sample of the protocols from the people task.

Chapter VII
Naming of Jobs in Disabled and Non-disabled children

Summary: A free association task requiring the subject to name jobs is sensitive to age, type of handicap, culture and social class. The SBH group is inferior to all groups including a group of LC non-disabled children.

In this subsection we will be concerned with the naming of jobs by spina bifida (both SBH and SBNH) and amputee children, as well as by both upper and lower class non-disabled children. Our interest in this task takes on particular significance for a number of reasons. First, it will be remembered from the preliminary section on naming that the means of occupational listings appear to parallel the means of listings of people for the different groups more closely than did the listings of animals or of leisure. Second, it appears that the listing of occupations is a task which is particularly sensitive to the influence of both socioeconomic and cultural deprivation factors. For example, Holland (1962) notes that in developing an occupational self concept, knowledge of occupations is an important component. Tyler and Sundberg (1965) used the number of jobs as a way of measuring cultural differences in Dutch American adolescents. We might therefore pose the question: Do children of various handicaps (SBH, SBNH and AMP) resemble more closely children from lower or children from upper classes? For example, we might expect that children with SBH would resemble those children from lower classes on this task due to the influence of cultural deprivation in both groups--On the other hand we might expect amputee children, who basically were not brain damaged and whose impairment appears to be less severe from a cognitive standpoint than that of the SBH children, to resemble upper class children. The contents of this particular listing are of special interest, because there are practically no data on the development of vocational concepts in normal as well as handicapped children. In previous studies in our center it has been pointed out that the vocational problems of spina bifida children upon reaching adulthood are manifold and difficult (Badell-Ribera, et.al, 1966). Furthermore, the extent of the vocational problems appears to be more directly related to intellectual factors than to the factors involved in being physically handicapped. The perceived vocational world of the spina bifida child would therefore be of interest in considering such questions as the notion of vocational readiness, and vocational counselling. For this reason we thought that a more intensive analysis of the job listings might be beneficial.

General Data Analysis

Since the subjects used for this particular study were the same as those used in the naming of people task, we will not repeat the discussion of their particular characteristics. Findings which are presented in' Table 37 indicate that the upper class children name more occupations than do any of the other groups. It is of interest to note that when the populations are broken down in terms of 3 age groups, the upper class children are consistently high, so that nearly forty to fifty per cent of these subjects approach the maximum of fifteen occupations at each age level.

Table 37:

Comparison of number of naming Jobs by Age, Social Class and Disability

		LC	UC	AMP	SBNH	SBH
Youngest	N	9	10	19	10	11
	M	4.0	11.60	6.26	6.60	3.45
	SD	3.81	3.60	2.98	2.80	4.32
	MDN	2	13	5.5	5	2.7
Middle	N	10	10	19	10	13
	M	10.40	13.60	11.57	10.40	6.62
	SD	4.27	2.07	4.01	5.08	3.88
	MDN	9.5	15	13	12	6
Oldest	N	10	10	18	12	14
	M	12.90	13.40	12.33	10.67	11.50
	SD	3.00	3.66	3.53	3.80	3.63
	MDN	14	15	14.5	11	13
Total	N	29	30	51	32	38
	M	9.27	12.87	9.86	9.31	7.50
	SD	5.20	3.21	4.42	4.28	5.08
	MDN	9.5	15	13.	11	6

Differences between groups

		df	t	p
LU vs UC		57	3.20	.01
LC vs AMP		78	0.54	NS
LC vs SBH		65	1.29	NS
LC vs SBNH		59	0.02	NS
UC vs AMP		79	3.26	.01
UC vs SBH		66	5.04	.001
UC vs SBNH		60	3.69	.001
AMP VS SBH		87	2.33	.05
AMP vs SBNH		81	0.56	NS
SBH vs SBNH		68	1.59	NS

Upper class children, in short, reach the ceiling at early ages in this task and keep at the ceiling throughout their development. This is not the case in all of the other groups, even though there is apparent growth with age. The AMP,LC, and SBNH groups are similar in terms of over-all productivity; however, differences in developmental patterns emerge. The youngest LC group resembles the SBH group, but at older ages it resembles the other groups. The SBH group which lags the most does not appear to catch up until the oldest age.

The data appear to support the concept that the SBH groups are inferior to all of the groups including the LC group in two ways - first, a much smaller per cent of SBH children offer the maximum of 15 jobs (see Table 38), and second, a much larger percent fail to mention jobs which involve college training. (Table 39).

Table 38: Percent of children (5 groups) Naming 15 jobs in terms of 3 age levels

	UC	LC	AMP	SBNH	SBH
Young	40	0	0	0	2
Middle	60	40	43	40	12
Old	80	50	45	25	26

Table 39: Percent of children (5 groups) Naming 0* or 1* Job based on college training

	UC	LC	AMP	SBNH	SBH
Young	10	100	63	62	100
Middle	40	80	36	30	85
Old	10	40	15	40	21

If we examine the number of jobs named by our handicapped groups of children in terms of their correlates, several points emerge - For all groups the number of jobs mentioned is highly related to both reading and arithmetic achievement, to digit span backwards and to the number of common animals. All of these may be considered aspects related to attention and cultural sophistication. The cultural sophistication interpretation is further supported by the fact that the number of jobs is related to different facets of verbal intelligence in all groups, to its direct correlation with family income in the, SBNH group ($r=.50$, $p<.05$, $n=21$). In the AMP group it is related to 3 of the 4 ITPA subtests (VD-$r = .59$, $p<.01$, ME-$r = .58$, $p<.01$, VE-$r = .48$, $p<.01$). The fragmentation of associated processes in the SBH child may be seen in the lack of correlation between number of jobs and number of people, two tasks which are highly related in both SBNH ($r= .65$, $p<.01$) and AMP ($r=.52$, $p<.01$), and lack of correlation with SES and ITPA variables.

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* 0 or 1 coding used to prevent Ss from being penalized for lack of productivity.

Chapter VIII

Aspects of Schooling

Summary: In this chapter we consider returns from a questionnaire completed by parents of 78 SB children and 91 AMP children. While more than 85% of the AMP attend regular schools, less than one-fourth of SBH and SBNHs do. SB children in regular or special education facilities show differences in social preference, type of transportation, bladder and bowel problems and their management. Type of school distinguishes verbal IQs in SBNH although there is considerable overlap, but it does not distinguish it in SBH. Severity of physical disability is not a critical factor.

Questionnaire Data

In this section our data will be based on questionnaires which were mailed to a total of 220 parents of spina bifida and amputee children. Out of a total of 100 questionnaires mailed to the parents of children with spina bifida, 78 were returned. Of 120 questionnaires which were mailed to parents of children with amputations, we received returns from 91. Data from the following items of our questionnaire will be presented:

(1) Location of school in terms of type of community.
(2) Type of school attended.
(3) Means of transportation to school.
(4) Types of devices and their management.
(5) Ordering of interpersonal preferences.
(6) Ranking of preferred activities.
(Due to the fact that all portions of the questionnaire were not always completed, our N's in each subsection will not be congruent).

1) Geographical location: Both the amputee and the spina bifida children live in similar areas. The rank order of frequency of location is (1) New York City, (2) Suburbs, (3) New York, New Jersey, and Connecticut, and (4) more distant places. The distribution of geographical location for our two groups of children may be seen in Table 40.

TABLE 40
Geographical Location of School

	Out of Town	NYC	Suburbs	N.Y. N.J. Conn.	N
AMP	4(5%)	42(53%)	26(33%)	7(9%)	79
SB	1(2%)	29(54%)	21(37%)	4(7%)	55

$X^2 = 1.21$, df=3, N.S.

2) Type of School: There appears to be a significant difference between the types of schools attended by the amputee children and those attended by the spina bifida children. While 87% of the amputee children attended regular classes in regular or nursery schools, only 19% of the SBH and 37% of SBNH children were included in this category. Distribution of type school attended by the SBH and SBNH children is presented in Table 41. The X^2 between these distributions do not reach the necessary level of significance.

TABLE 41

Type of School Attended by SBH and SBNH children*

SBH		Type School	SBNH	
N	%		N	%
11	28	Regular	11	37
8	20	Health **	12	7
21	53	Special	16	50
0	0	Home	2	7

$X^2 = 3.46$, p N.S.

This finding is interesting because our data indicate that our non-hydrocephalic children are slightly brighter (Table 15) and less disabled than our hydrocephalic group (Table 42)

TABLE 42

Relationship between severity of disability and type of disability.

	Most				Least	
Category	1	2	3	4	5	
SBH	10	13	5	1	0	29
SBNH	1	4	6	6	3	20

$X^2 = 16.33$, $p < .01$

Although a significantly smaller number of children with spina bifida attend regular school when compared with the AMP, this figure is somewhat comparable to that reported by Burns (1966) in a study of school placements in Liverpool, where it was concluded on the basis of a city-wide survey that 39% of children suffering from encephalocele and meningomyelocele would be able to receive regular educations.

* Type school data was accumulated from a variety of sources. This accounts for the discrepancies in our N's in the various data presentations.

** Health class - A class for children with orthopedic and neuro-muscular handicaps.

3) Interpersonal Preferences: Our data permit us to identify some social preferences which are associated with type of school that the child attends. While these preferences are not in themselves startling, the findings are of interest because of the paucity of data in this area. (Table 43).

TABLE 43

Correlations--Type of School Attended and Social Preference in Amputees (N=78) and Spina Bifida (N=56)

	Special School		Normal School Normal Class		Normal School Health Class	
	AMP.	S-B	AMP	S-B	AMP	S-B
Prefers Own Age	-.17(4)	-.05(21)	-.10(68)	.39(11)	.04(6)	-35(33)
Disabled Children	.15(4)	.27(21)	.06(68)	.45(11)	-.03(6)	.09(33)
Visit Relatives	-.05(4)	.16(21)	.19(58)	.22(11)	.31(6)	.06(33)
Sports	-.21(4)	-.07(21)	.38(68)	.14(11)	-.22(6)	.23(33)

$^{**}p < .01$, $^{*}p < .05$

Spina bifida children vary in their interpersoanl preferences according to the type of school attended; amputee children do not. SB children in regular schools prefer children of their own age (r= .39, N=56, p < .01) while they reject other disabled children. Those SB children attending special schools prefer disabled children, while those attending special classes in regular schools do not prefer children their own age. In the case of the amputee children, the effect of type of school is reflected in a different way, in that attendance in regular class is associated with preferences for sports, while attendance in a special class is associated with visiting relatives.

4) Type of Transportation: In view of the fact that the type of transportation required to go to and from school is a major problem in the logistics of educating physically handicapped children, it is of interest to note that 70% of the amputee children did not require a school bus. This group walked to school (47%), or were driven by private car (11%) or took a public bus (11%). On the other hand, only a total of 42% of the SBNH and 18% of the SBH children were in these three categories. The majority of spina bifida children get to and from school by bus. Thus the school bus is the major means of transportation for the SBH and to a certain extent the SBNH. The AMP walk to school and the SBNH are more likely to walk than the SBH. (Table 44).

TABLE 44
Type of Transportation to School

	School Bus	Walking	Private Car	Public Bus	
AMP	23(30%)	37(47%)	9(11%)	9(11%)	78
SBNH	17(58%)	7 (24%)	2(7%)	2(7 %)	28
SBH	21(82%)	1 (4 %)	4(16%)	0 (10%)	26

SBNH vs AMP	SBH vs AMP	SBH vs SBNH
$X^2=5.92$	$X^2=72.3$	$X^2=82.6$
df= 3	df = 3	df = 3
NS	$p < .001$	$p < .001$

5) Physical Problems and Schooling

(a) Spina Bifida:

1) Management of bladder:

a) Use of collecting device

	Yes	No
SBH regular class (SBHRC)	10	0
SBH special class (SBHSC)	18	0
SBNH regular class (SBNHRC)	10	2
SBNH special class (SBNHSC)	13	1

b) Devices for bladder:

Table 45: Type collecting device and satisfaction with it.(Yes, No)

	CUB *			Bricker			Rubber Pants		
	Yes	No	Sum	Yes	No	Sum	Yes	No	Sum
SBHRC	3	1	4	4	0	4	2	1	3
SBHSC	6	1	7	3	0	3	4	7	11
SBNHRC	4	3	7	0	0	0	2	0	2
SBNHSC	3	2	5	3	0	3	4	5	9

* Child's Urinal Bag.

c) Management problems:

Table 46: Management Problems and Type of Collecting Device

		No. Prob.	Prob. handles self	Needs help at school	Comes home for help
SBHRC	Bricker	2	2	0	0
	CUB	1	3	0	0
	R. Pants	0	1	2	0
SBHSC	Bricker	2	1	0	0
	CUB	4	1	1	0
	R. Pants	1	2	8	0
SBNHRC	Bricker	0	0	0	0
	CUB	0	6	0	1
	R. Pants	0	1	1	0
SBNHSC	Bricker	1	2	0	0
	CUB	0	2	3	0
	R.Pants	0	4	5	0

2) Frequency of Bowel Accidents:

Table 47: Frequency of Bowel accidents in special and regular classes

	Rarely	Monthly	Weekly	Daily--
SBHRC	5	4	1	0
SBHSC	5	5	1	7
SBNHRC	5	2	2	1
SBNHSC	2	3	6	3

3) Ambulation Devices:

Table 48: Use of Ambulation devices at home and at school

Group	Type Device	Where used		None	Sum
		Home	School		
SBNHRC	Wheelchair	1	0	5	12
	Crutches	2	2		
	Brace	4	4		
SBNHSC	Wheelchair	7	6	3	22
	Crutches	6	6		
	Brace	6	5		

Table 48 continued.

Group	Type Device	Where used		None	Sum
		Home	School		
SBHRC	Wheelchair	5	5	2	19
	Crutches	5	5		
	Brace	7	7		
SBHSC	Wheelchair	1	4	0	19
	Crutches	7	6		
	Brace	11	9		

4) Had to move closer to school.

Yes - 3, No - 48

b) Special Problems of Amputees

	Yes	No
1. Prosthesis at home	60	19
2. Prosthesis at school	62	15

Attending a regular class in a regular school is generally not related to features of physical disability as they manifest themselves in children with amputations. It is however, related to some features of disability in those children with spina bifida. Apparently the use of a collective device per se is not related to either disability or the type of school attended. In other words 94% of the spina bifida children that we studied used some form of collecting device. Apparently the Bricker procedure is more common among the SBH than the SBNH. This means of bladder management also results in fewer problems and is more pleasing to parents than rubber pants or the CUB appliance. Furthermore, in both the SBH and SBNH groups the use of rubber pants is more commonly found in special classes than in regular classes and it results in more parental dissatisfaction than either the Bricker procedure or the CUB appliance. The use of rubber pants also is more difficult for the child to manage by himself. This causes him to seek more frequent assistance at school in handling the problems associated with urinary incontinence. Those children in regular classes (both SBH and SBNH) are more competent in managing their bladder difficulties than those in special classes.

While the association, between frequency of bowel accidents and the type of school fell short of significance, the data seem to reflect the fact that the more frequent the accident rate, the greater the possibility of not attending a regular class.

While factors associated with ambulation impairment are not significantly related to type of school, the trends of the data suggest that with larger samples such relationships might be found, so that hard and fast conclusions cannot be offered. For instance, one-third of the children attending normal classes in regular schools wear crutches at home and/or in school. This is true for half of the children attending school in other settings, while more than half the children using wheelchairs at home attend special schools less than one-fourth of the children in regular schools use wheelchairs at home and more than three-fourths of them use braces at home. Furthermore, more SBNHRC children do not use ambulating devices than SBNHSC children. This relationship also exists for the SBHRC and SBHSC. When examining those SBH and SBNH in special classes apparently the SBH children more frequently use braces and the SBNH children more frequently use wheelchairs. (X^2=6.05, df=2, $p < .05$). Although as previously stated the relationship between type ambulation device and type school is difficult to decipher, the SBNHRC tend to walk to school while the SBNHSC take school buses (X^2=12.08, df=3, $p < .001$). Thus the means of transportation to school rather than the device used at school appears to be related to type class in the SBNH group.

Intellectual Functioning and Type School attended

If the type of school is associated with selected physical factors, we might ask whether there are mental abilities associated with the type of school? The criteria for the placement of a handicapped child into an appropriate class in New York City are based primarily on the child's ability to ambulate and means of ambulation, with little regard as to his level of current intellectual functioning. Our data shed some light on the relevance of ambulation as a criterion for class placement.

Table 49:. IQs of Spina Bifida Children in Regular and Special Classes

		SBNHRC	SBNHSC	SBHRC	SBHSC
VIQ	N	11	15	10	17
	M	110.8	97.6	97.7	92.8
	SD	15.1	26.2	17.2	17.1
PIQ	N	9	13	10	18
	M	99.7	96.9	87.8	84.1
	SD	14.5	20.7	16.0	19.0
FSIQ	N	9	13	10	17
	M	104.3	96.0	92.5	87.3
	SD	13.5	23.5	14.8	18.0

Table 50: Per cent of IQs below 100

	VIQ	PIQ	FSIQ
SBNHRC	18	55	33
SBNHSC	47	54	54
SBHRC	60	80	60
SBHSC	68	72	70
AMP	31	44	31

TABLE 51

Range I.Q. of Spina Bifida Children
in Regular and Special Class

	AMP	SBNHRC	SBNHSC	SBHRC	SBHSC
Verbal I.Q.	66-135	90-138	69-134	69-129	72-124
Perf. I.Q.	64-125	78-122	67-136	66-115	55-118
Full Scale I.Q.	67-127	88-126	64-138	69-112	59-122

Inspection of tables 49-51, indicates both the degree of overlap in intelligence between the children in the various types of classes and the wide range of I.Q. within each type of class. Furthermore, approximately 50% of the SBNHSC have IQ's equivalent to SBNH children in regular classes. Since the 3 groups of subjects all started out at approximately the same intelligence level (table 18), apparently verbal intelligence may be lowered in SBNH children attending special classes, but the type of school attended is not a factor which interfers with the SBH.

An indication of the important role played by the severity of a spina bifida child's disability in class assignment may be gleaned from inspection of table 49.

TABLE 52
Mean Scale Value for Severity of Disability

	Mean	SD	N	
SBNHRC	4.2	1.0	11)	) df 25, $t=2.81$, $p < .01$
SBNHSC	3.1	1.0	16)	
SBHRC	2.0	1.2	11	
SBHSC	2.3	0.9	21	

Thus our data indicate that those SBNH children in special classes are more disabled but may or may not be less intelligent than those SBNH children in regular classes, while those SBH children in special classes are about as disabled and as intelligent as those in regular classes. Although there seem to be more differences between children or the hydrocephalic/non-hydrocephalic disability grouping than within the regular/special categorization of each disability group, it should be noted that the SBNH regulars appear to be slightly better off than the SBNH specials while only small differences are found between the SBH regulars and the SBH specials. However, it is interesting to note that within SBNH special group there is a range of disability level from 4-1 and a range of I.Q. from 138-64. Furthermore, the more disabled children are not those with the lowest I.Qs.

Another point of interest is that there is a tendency in those SBNH children in regular classes to surpass the amputees (who attend regular class school) on three variables: Vocabulary, similarities, and reading. Each of these variables is a good predictor of school achievement.

Two points are clear from the examination of these data. First, Spina Bifida children may be classified into special classes according to educationally irrelevant variables. Second, in order for a SBNH child to gain placement in a regular class, he must clearly be of a certain intelligence level, whereas this is not the case with the amputee children. Another explanation of these data would argue that there is least overlap between SBNHR and SBNHS on Verbal I.Q. This could possibly indicate lower verbal functioning in those SBNH children in special classes and that a special class tends to dull verbal intelligence. This finding is similar to one reported for children with muscular dystrophy. (Morrow, and Cohen 1954).

It still remains unclear as to what indices the school administrator employs in placing a spina bifida child into a regular or special class. Apparently the use of rubber pants and a high incidence of bowel accidents do not favor the childs being placed in a regular class. Furthermore SBNHRC children are less severely disabled, more likely to walk to school and less likely to use ambulating devices than SBNHSC children. Due to the fact that the distributions of I.Q in our groups overlap considerably, trying to pinpoint the role that intellectual functioning plays in class placement is even more difficult. However, our data do seem to indicate that some SBNH children would be considered to be misplaced if intelligence were among the major criteria being considered.

Chapter IX

Social Correlates of Education and Intelligence in SBH, SBNH, and AMP

Summary: Analysis of social correlates reveals that they play a much more pervasive role in SBNH and AMP than in the SBH group.

The social factors which might play a role in the mental development and education of handicapped and brain injured children have not been well studied. Kelman (1964) and Richardson (1964) in their reviews of social aspects of brain injured children note the paucity of hard data in this area, and while social conditions have been studied in relation to the etiology of handicaps (Knoblock and Pasamanick, 1959) (Birch 1968) there is very little on the fate of a handicapped child in different kinds of social environments. One can therefore pose the following broad question:-- Will the educational and psychological functioning of different kinds of handicapping conditions reflect the effects of socio-cultural factors or will the constraints imposed by the neurologic impairment vitiate the expected effects?

Data Analysis and General Findings

Our measures included the following variables which could generate data to answer this question: (1) Socio-economic status--a composite measure based on three scales; parent occupation, income and education, derived from the work of Langner and his associates (1962). (2) Ethnicity (white, Negro, Puerto Rican). (3) Home situation (divorced, separated, family tensions), (4) Size of family, (5) Ordinal position in family.

The data indicate that our three groups of disabled children are basically similar on our SES scales (table 50) and that the individual scales correlate highly with each other. (table 51).

TABLE 53
Socio-economic Status on 4 Dimensions for 3 Groups.

	SBH			SBNH			AMP		
	N	M	SD	N	M	SD	N	M	SD
SES	40	3.6	1.5	26	3.1	1.6	51	3.2	1.7
OCCUP.	40	3.6	1.5	26	3.1	1.6	50	3.2	1.5
EDUC.	30	4.3	1.5	19	4.3	1.7	20	4.2	2.1
INCOME	39	3.1	1.5	22	2.5	1.3	42	2.8	1.2

TABLE 54

Correlations Between Socio-economic Status Scales

	SBH				SBNH			
	SES	OCC.	ED.	INC.	SES	OCC.	ED.	INC.
SES		.78(40)	.80(30)	.81(39)		.80(26)	.89(19)	.78(22)
OCC			.84(27)	.74(31)			.72(17)	.85(20
ED				.68(28)			.58(13)	

AMP

	SES	OCC	ED	INC
SES		.80(48)	.80(22)	.76(41)
OCC			.84(19)	.73(20)
ED				.69(16)

All correlations significant at better than $p < .01$.

The major findings (Tables 52, 53, 54) may be stated as follows: (1) SES factors play a role in the SBNH and AMP groups but not in the SBH group. The content areas sampled by verbal subtests of the WISC appear to be more effected by social factors than the domains tapped the performance subtests.(2) The verbal subtests are more frequently highly associated with the constellation of social factors as presented by the SBNH group (30 significant correlations) than by the AMP group (14 significant correlations). They appear to be equally related for all of the three SES scales. We might therefore state that the higher the SES the brighter the child if he is an SBNH or AMP (3) Scores on the MAT--reading and arithmetic are related to parental occupation ($df=22$, $r=.45$ and $.46$ $p < .01$) in the SBNH group but not in the other two disability groups. The lack of relationship in the SBH and AMP groups is not immediately clear. We might speculate that for the SBH group neurologic factors modify SES effects. For the AMP, the situation is less clear. With regard to the SBHs the major SES variable which is relevant is family income. The wealthier the family the greater utilization of urinary devices ($df=16$, $r= .52$, $p < .05$) and higher the score on 3 verbal and 1 performance ($p < .08$) scale from the intelligence test ($df=29$, $r= .41$, $p < .05$). (4) In the SBNH group parents with higher incomes ($df=20$, $r=.40$, $p < .07$), better occupations ($df=24$, $r=.60$, $p < .01$) and more education ($df=17$, $r=.61$, $p < .01$) have smaller families. Their handicapped children tend to be first borns This may simply reflect the negative relationship between SES factors and family size. Middle class families are smaller than lower class families.

TABLE: 55 CORRELATES OF SOCIAL FACTORS I ***

	Correlates of Father's Occupation			Correlates of Family Income		
	SBH	SBNH	AMP	SBH	SBNH	AMP
DSF	** -.85 (10)	NS	NS	NS	NS	NS
VIQ	NS	** .65 (25)	** .45 (44)	NS	** .66 (22)	** .55 (32)
PIQ	NS	* .43 (22)	** .53 (44)	NS	** .61 (21)	** .49 (36)
FSIQ	NS	** .56 (22)	** .52 (43)	NS	** .66 (21)	** .56 (35)
COMP	NS	** .67 (22)	** .45 (41)	* .50 (25)	** .66 (20)	NS
ARITH	NS	** .54 (22)	** .39 (43)	NS	* .47 (20)	** .47 (35)
SIM	NS	** .56 (23)	** .45 (43)	NS	** .55 (21)	** .52 (35)
VOC	NS	* .38 (18)	** .45 (41)	* .52 (17)	* .49 (17)	* .37 (33)
INF	NS	** .57 (28)	** .43 (43)	* .41 (25)	** .61 (21)	* .52 (35)
DSY	NS	* .50 (20)	NS	NS	* .54 (20)	NS
ME	NS	NS	* .31 (50)	NS	NS	NS
PA	NS	NS	** .40 (41)	* .45 (31)	* .55 (18)	** .49 (34)
OA	NS	NS	** .37 (42)	NS	NS	* .38 (37)
Birth Order	NS	** -.56 (25)	NS	NS	NS	NS
Use of Urinary Dev.	NS	NS	NS	* .52 (16)	NS	NS
No. in Family	NS	NS	NS	NS	* .42 (22)	NS
Severity of Disability	NS	NS	NS	NS	** .59 (22)	NS
PC	NS	NS	NS	NS	* .44 (20)	NS
BD	NS	NS	NS	NS	* .44 (20)	NS

* p < .05 ** p < .01

*** Tables 55, 56, 57 only includes the variables significantly related to the various factors in at least one of the 3 groups.

TABLE: 56 CORRELATES OF SOCIAL FACTORS II

	Correlates of Socio-economic Status			Correlates of Parent Education		
	SBH	SBNH	AMP	SBH	SBNH	AMP
VIQ	NS	** .64 (30)	NS	NS	** .72 (19)	NS
PIQ	NS	* .46 (26)	* .37 (44)	NS	NS	* .53 (18)
FSIQ	NS	** .55 (26)	* .35 (43)	NS	* .61 (16)	* .52 (17)
INF	NS	** .63 (27)	NS	NS	** .80 (16)	NS
COMP	NS	** .73 (25)	NS	NS	** .77 (16)	NS
ARITH	NS	* .46 (26)	.33 (43)	NS	** .59 (16)	NS
SIM	NS	** .57 (26)	NS	NS	** .78 (17)	* .53 (17)
VOC	NS	** .63 (19)	NS	NS	** .81 (14)	* .61 (16)
DSPT	NS	* .44 (26)	NS	NS	NS	NS
BD	NS	* .46 (25)	NS	NS	NS	NS
DSY	NS	* .50 (24)	NS	NS	** .69 (15)	* .57 (15)
No. in Family	NS	NS	NS	NS	** -.69 (19)	NS
Birth Order	NS	NS	NS	NS	* -.55 (18)	NS
PC	NS	NS	NS	NS	* .52 (15)	NS

* $p < .05$ ** $p < ,01$

TABLE: 57

CORRELATES OF RACE*

Correlates of White | Correlates of Puerto Rican

	SBH	SBNH	AMP	SBH	SBNH	AMP
VIQ	NS	** .49 (30)	** .48 (46)	NS	NS	* -36 (43)
PIQ	NS	** .56 (26)	* .35 (46)	NS	NS	NS
FSIQ	NS	** .61 (26)	** .44 (45)	NS	NS	NS
INF	NS	NS	** .45 (45)	NS	NS	* -.36 (43)
ARITH	NS	* .42 (26)	* .35 (45)	NS	NS	NS
SIM	NS	** .52 (26)	* .35 (45)	NS	NS	NS
PA	NS	* .55 (18)	NS	NS	-.51 (18)	NS
VOC	NS	NS	** .52 (43)	NS	NS	NS
DSPT	NS	NS	** .45 (41)	NS	NS	** -.44 (41)
DSY	NS	** .69 (24)	* .35 (38)	NS	** -.59 (24)	* -.34 (38)
COMP	NS	* .42 (25)	NS	NS	NS	NS
PC	NS	* .41 (24)	NS	NS	** -.55 (24)	NS
BD	NS	** .59 (23)	NS	NS	NS	NS
No. in Fam.	NS	* -.64 (32)	NS	NS	NS	NS
Birth Order	NS	** .52 (37)	NS	NS	NS	NS
OA	NS	NS	NS	NS	** .53 (23)	NS

Correlates of Negro

	SBH	SBNH	AMP
VIQ	NS	* -.37 (35)	** -.37 (46)
PIQ	NS	** -.60 (26)	* -.28 (46)
FSIQ	NS	* -.54 (26)	* -.36 (45)
VOC	NS	NS	** -.37 (43)
No. in Family	NS	** .59 (32)	NS
Birth Order	NS	** .60 (31)	NS

* p < .05 **p < .01

* These categories of racial factors refer to the designated variables as opposed to all the others.

The direction of this relationship is less pronounced in the case of the AMPs where higher occupational level is associated with smaller families (df = 27, r=.30, $p<.10$) and higher education is related to having handicapped children closer to first born positions (df= 17, r= -.50, $p<.05$).

(5) Ethnic factors appear to influence some of the findings. Approximately 80 per cent of the three groups are white with the remainder being Negro or Puerto Rican. The SBH group contained only one Negro child and 7 Puerto Rican children. The SBNH group contained 5 Negro children and 1 Puerto Rican and the AMP group contained 7 Negro children and 4 Puerto Rican children. While the sample is small it is of interest to note (Swinyard,1966) that spina bifida has a low incidence among Negro children. The confounding effects of class and ethnicity appears in the SBNH and AMP groups where white children perform significantly better on both verbal and performance intelligence although school achievements are not affected. Ethnic differences are not related to intelligence or school achievement in the SBH group.

(6) Ratings of family tensions in the home situation which are manifested by divorce, separation, and poor relationships in families which remain together are about equal in all three groups. However it may be noted that tensions in the home is related to SES for the SBNH group (df=28, r=.42, $p<.05$) and the AMP group (df=48, r=.39, $p<.01$)

(7) If we examine the relationships between SES and severity of disability, the most striking finding is that in the SBH group severity of disability plays a role similar to that which SES plays in SBNH and AMP. For example, severity of disability is related to a number of verbal intelligence tests (Information = df= 35, r=.33, $p<.05$; Comprehension= df=35, r= .33, $p<.05$; and similarities = df= 35, r=.45, $p<.01$). The less disabled the child, the better he performs on these tasks. Furthermore, children who are more disabled in the SBH group tend to be closer to first born positions (df=43, r=.43, $p<.05$).

While it is difficult to draw firm conclusions in the light of the complex interactions of so many variables and such small sample sizes, nevertheless the data as a whole are congruent with the following pictures (Figure 16). In general, our data seems to indicate that in a seemingly brain damaged (SBH) population the positive effects of higher SES do not appear to attenuate the effects of the insult to the brain. In 2 populations of handicapped children (SBNH, AMP) the many faceted interactions between SES, intelligence, achievement, family size and situation and ordinality are deciphered. Furthermore those handicapped children from either Negro or Puerto Rican backgrounds must overcome the disabilities associated both with their race and their handicap.

Since these data are derived empirically rather than from an initial hypothesis we recognize that we may be capitalizing on chance. However, we have for the most part correlates at better than the .01 level. Furthermore, the findings appear to be congruent with each other.

Part III : Conclusions and Recommendations

Chapter X

Conclusions and Recommendations

A number of themes underlie our findings with regard to the three groups of children studied. Before presenting them it might be useful to recapitulate the major results for each group of subjects studied.

SBH

SBH children lag in academic achievement, psycholinguistic skills, intelligence (although their verbal intelligence is within the normal range) free associations involving interpersonal recall and occupations. Their schooling is different from other children in the sense that they require bussing and fewer than 10 per cent of them attend normal classes in regular schools. The major characteristic associated with type of school placement is incontinence and its management. While the SBH group appears more handicapped from an ambulation standpoint than the SBNHs it is not the impairment of mobility or intelligence per se which is critical in determining school placement. Of final importance is the fact that the usual relationships between SES factors and academic and intellectual attainments are negligible in our subjects.

From a longitudinal standpoint it is important to note that the lag in reading and arithmetic occurs at all age levels, although it may not be manifested statistically in the youngest group because of the small size of our sample in this age range. Arithmetic skills appear to flatten at the oldest age range (11-15), where attainments in this skill are about the same as that of the 8-10 group. Psycholinguistic skills improve with age but there is a similar leveling off in the ability to express an idea either in words or gestures. It might also be noted that there is a lag in the ability to interpret visual material. This lag is present in the youngest children and widens with age. This lag, in which the child is functioning at a low average level between the age of 5-7 and then drops to a defective level, is paralleled by the decline in performance intelligence from average to borderline and in his drawings from low average to defective. Yet through all of these ages the typical verbal intelligence remains normal. Of interest here is the fact the number of free associations to people as measured by our interpersonal recall task increases with age, as does the number of occupations. In the interpersonal recall tasks the rise in number of names does not take place until the child is at the oldest age level, a finding which is at variance with that of all the other groups in our study in which increase occurs at earlier ages. A parallel phenomenon is found in listing the number of jobs.

How can we make sense of all of these data from the standpoint of the educator? We might suggest several critical notions (1) For the SBH group, neurologic variables, especially as related to cognitive functioning, and rehabilitation variables, particularly as related to incontinence, play a much more salient role than hitherto suspected. (2) From a cognitive personality standpoint the SBH child is a complex entity. He shows a disassociation of abilities which is manifested in three ways--first by the fact that he might use different sets of abilities to master academic skills than does a normal child; second, he shows lags and growths in abilities which are different from those of normal children. Third, his verbalizations are not always congruent with his actions. The teacher and the psychologist should therefore be wary of drawing inferences from one set of abilities and applying them to another. Because the child can say the answer does not mean he understands it. (3) The seeds of the child's cognitive dysfunctions are manifested in the earliest years but they may be obscured by the fact that academic task, demands shift with the years. The child's ability to decipher verbal material may obscure his difficulty in deciphering visual material. (4) The disassociation of skills found in the SBH group indicate that the expected skills employed by children involved in problem solving do not cohere in this group. While certain skills do cohere, these clusters are anomalous due to the fact that they deviate from normal patterns. Indeed, the problem in brain-damaged children may not be one of disassociation of skills but one of the reassociation of skills so that clusters of skills appear to manifest different kinds of lawfulness.

SBNH

Mentally the SBNH group falls in between the SBH and AMP groups (Academic achievement intelligence VD, recall of people and leisure). These children resemble the SBH group in some ways (Mediation, preschool achievement, personality descriptions) and the AMP group in others (psycholinguistic abilities, VD, ME, VE and DAP). The complexity of the organization of cognitive functioning in the SBNH is seen in the weak relationships between psycholinguistic abilities and academic achievements.

Examination of changes in mental functioning with age also reflects complexity. For example, academic achievements are unrelated to chronologic age. There are lags in intelligence, arithmetic achievement, draw a person, mediation and number of people named in the 8-10 group. However, in the 11-15 group these lags have been eliminated. The lags might be due in part to aspects of schooling--including the possibility of late school entry because of community regulations, or frequent absence from school due to hospitalizations, or type of school attended.

In many ways the SBNH child reflects the social and cultural management of his condition rather than the condition per se. This is seen in the depression of the verbal intelligence in almost half of the group which attends special schools and in the effects of SES factors or mental functioning.

AMP

The AMP group appears to demonstrate normal academic attainments and mental functioning which are essentially related to SES variables rather than to disability. From an educator's standpoint the problems of the disability are less in the academic than in the personal-social domain. These problems do not manifest themselves sufficiently strongly to be tapped by our instruments or to appear in group trends, although the decline in draw-a-person scales in the oldest group may reflect the interpersonal problems of the early adolescent amputee.

Limitations of the Study

These conditions may be qualified by several unavoidable limitations which would include (1) The size of our samples, particularly when considering age by disability comparisons. (2) The problem of measurement which are manifested differently in our various instruments.* (3) The length of our test battery. This factor often forced us to spread our testing over several sessions leading to an increased probability of subject attrition which accounts for the uneven number of cases in the different substudies.

Further limitations stems from the retrospective nature of our study Although the clinic covers a wide SES spectrum within a geographical region, it is still possible that had we looked at population anterospectivel other results might have been obtained. Such experiences are not unusual in the field of brain injured children. For example, Thomas, Chess & Birch (1968) cite the fate of a number of children identified as brain injured early in life whose future fate during school years was highly determined by social considerations, e.g. the ways in which the parents managed the situation, which in turn could influence what child came to notice. In another context, Windle (1968), in his work on the effects of oxygen distributions on the new-born, suggests that many symptoms of brain injury which are noticeable in young children may disappear with age. In theory the reverse might also occur. In our situation however, there two factors which might ameliorate the limitations inherent in our retrospective method. One is the fact that the IRM sample was drawn from a program which was designed to encompass as wide a variety of spina bifida eases as possible. Second is the fact that the SES correlates for the SBH and SBNH groups differed. Whatever factors SES blankets with regard to spina bifida children it does this differently for the SBH and SBNH conditions. Nevertheless, these limitations do not vitiate the value of our findings, although they do perhaps limit the generalizability of our conclusion. The findings and the tendencies of each of our groups remain loud and clear.

* (a) Metropolitan Achievement tests--the tasks change at different academic levels.
(b) ITPA and Frostig--the ceiling of these tests is far below the maximum age range of our subjects.
(c) Association tasks--these were devised by us to meet some of the problems of this study, but we must recognize that the whole area of serial association is a complex one.

Discussion and Recommendations

Our original hypothesis when commencing this study was that a visual-motor and/or performance lag would be found. However, upon delving into the data we were struck by the disassociation encountered when studying the SBH group causing us to speculate as to the causes of this disassociation. We are of the opinion that the disassociation of skills might be more central than the visual-motor lag. We may speculate about several cognitive mechanisms which we could not study due to the linitations of our instruments. These mechanisms would include: disinhibition, means-ends and seriation.

We had hoped to base some of our findings upon our observations of spina bifida children in educational settings, but realistic factors limited our ability to study subjects in the classroom:- The spina bifida children were scattered in many different classrooms. There were only one or two spina bifida children in each classroom, that we observed, hence any observations which we did make were based on the individual and idiosyncratic differences found in each of the children studied.

Frequently teachers would comment to us that they sensed something different about spina bifida children but they were unable to pinpoint either the reason for or the source of these differences. When we indicated to them the disassociation of action and verbalization and demonstrated it to them based upon our observations they were glad to see that panameters along these lines were under investigation. With this point in mind we feel that the following recommendations are relevant:

(1) Since the patterns of skills, abilities and associated problems of management manifested in the SBH child are diverse, careful and intensive psychological, educational and medical services are needed. Multidisciplinary evaluation of the SBNH child are also indicated in order to plan appropriate programs of both management and education. Particular care should be made on the part of all investigating to avoid generalizing from competence in one area to the next.

(2) The planners in special education must pay particular attention to the ecological aspects of schooling of the SBH group--how do children get to school, how do they manage their disability? How congruent are the factors of bowel and bladder, management and ambulation skill with both the intellectual functioning of and the school placement of the SBNH child?

(3) Earlier programs of educational intervention and study should be initiated. These programs should stress remediation of specific defects, e.g. disassociation of cognitive skills like actions and words and environmental enrichment, and the management and rehabilitation of the multiple factors associated with specific individual disabilities.

(4) Programs evaluating the nature of the goals of education from a developmental vocational standpoint should also be considered. The immaturity in the domain of knowledge of occupations is quite striking in the SBH group.

(5) Although special education systems may be needed in the SBH group, in the SBNH group they may be academically noxious. Therefore different ways of setting up educational programs for this group is recommended. These programs should attempt to clarify the issues involved in the appropriate school placement of the SBNH child and the necessity of establishing appropriate subgroups of children in school channeled according to both their intellectual and somatic functioning. Type of disability as opposed to actual competence should not be the major index used in school placement.

(6) Continued investigation of the cognitive functioning of these groups of children. This would help elucidate the various cognitive mechanisms related to the disassociation found in the SBH child.

(7) The next step in future research based on our findings would be to correlate observations of cognitive functioning in these children with classroom learning and teaching.

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APPENDIX A

APPENDIX A_1

DETERMINATION OF SOCIO-ECONOMIC STATUS*

EDUCATION	Score	OCCUPATION	Score	INCOME **	Score
Some grammar school	- (1)	Blue Collar Low	- (1)	$ 0- 2,999	- (1)
Grammar school grad.	- (2)	Blue Collar Middle	- (2)	3- 5,999	- (2)
Some high school	- (3)	Blue Collar High	- (3)	6- 8,999	- (3)
High School grad.	- (4)	White Collar Low	- (4)	9- 11,999	- (4)
Some college	- (5)	White Collar Middle	- (5)	12- 14,999	- (5)
College Grad.	- (6)	White Collar High	- (6)	15- Over	- (6)

CODE

Low SES = Total score of 3 - 9
Middle SES = Total score of 10 - 16
High SES = Total score of 17 - 18

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* Based on scale devised by Langner and Srole. Mental Health in the Metropolis. McGraw Hill, Inc. 1962.

APPENDIX A_2

SES CLASSIFICATIONS

Code: 3-10 = Low SES
11-16 = Middle SES
17-18 = High SES

SCORE	OCCUPATION	EDUCATION	INCOME
1	Blue Collar Low	No School Some Grammar 1	Under $2,999 yr. 1
2	Blue Collar Middle	Grammar School Grad (Through Eighth Grade) 2	$3,000 - $5,999 2
3	Blue Collar High	Some High School 3	$6,000 - $8, 999 3
4	White Collar Low	High School Grad 4	$9,000 - $11,999 4
5	White Collar Middle	Some College 5	$12,000 - $14,999 5
6	White Collar High	College Grad and over 6	$15,000 - over 6

APPENDIX A_3

OCCUPATIONAL CODE FOR SES

White Collar High	Owner high Mgr. and official high Professional and self-employed Artist self-employed Professional employed by others
White Collar Middle	Owner-proprieter middle Farm high and middle (owner) Mgr. and official middle Artist employed by others Semi-professional Sales high Clerical high
White Collar Low	Owner-proprieter low Mgr. and official low Sales and clerical low
Blue Collar High	Service high Skilled manual self-employed Farmer low Skilled manual employed by others
Blue Collar Middle	Semi-skilled Self-employed and employed by others
Blue Collar Low	Farmer low (tenant) Service low Unskilled labor

APPENDIX B

APPENDIX B_1

Table - Categories employed in the Determination of Severity of Disability in Spina Bifida Children.

Group I-	No motor power is present in the lower extremities but it is good in the trunk and above.
Group II-	Motor power is present for hip flexion and adduction and some knee extension may be present.
Group III-	Motor power is present for hip flexion and adduction, knee extension, and flexion and dorsiflexion of the ankle.
Group IV -	Motor power is good in the hip except for extension and abduction. Knee extension and flexion are good and there is some plantar flexion, eversion of the ankle and movement of the toes.
Group V -	Motor power is functionally normal in the lower extremities. There is some loss in the perineal area affecting sphincter control.

APPENDIX C

NEW YORK UNIVERSITY MEDICAL CENTER
Institute of Rehabilitation Medicine
400 EAST 34TH STREET, NEW YORK, N.Y. 10016
AREA 212 679-3200
CABLE ADDRESS: NYU MEDIC

Dear Parent:

The Psychology Department at the Institute of Rehabilitation Medicine, New York University Medical Center, is interested in studying the educational achievements of handicapped children. To help us carry out this study, the Department has received a grant from the U.S. Office of Education. We would appreciate your cooperation in filling out the following educational questionnaire and returning it in the enclosed envelope. Thank you.

Leonard Diller
Leonard Diller, Ph.D.
Chief, Behavioral Science

- -

NAME: ____________________ Telephone: ____________

Address: ______________________________

Name of parent filling out form: ____________________

Child's age: ______ Birth date: ____________ Grade: ________

1. Does your child go to school? YES_____ NO_____

2. What is the name of the school? ____________________

3. Where is it located? ____________________

4. What type of school does your child attend? (Check one)

Special school ________
Nursery school ________
Normal school, regular class, ________
Normal school, special class, ________
Home instruction ________

5. By what means of transportation does your child get to school?

School bus ____________

Walk ____________

Private trans ____________

Public bus ____________

6. Does your child use a prosthesis at: School______ Home ___________

7. How well does your child manage bowel and bladder in school? (check one)

(a) No problem__________
(b) A problem, but handles it himself ___________
(c) Requires help in school if yes, who helps?
____
(d) Comes home for assistance.
____

8. Does your child have special urinary collecting devices? Yes _____ NO__________

a. If yes Rubber pants-with padding or diaper___________________
CUB appliance - valve or leg bag ___________________
Bricker operation - with Gricks Appliance _________________________

9. Are you satisfied with this method of managing urinary incontinence?

Yes_________________
No_________________

If no, what is the problem?____

____

____

10. Does he have bowel accidents?

a. less than once a month ________
b. once a month_______________
c. once a week_______________
d. daily_______________________

11. Number in order of importance the children your child prefer to be with. Number 1 refers to the group your child most prefers to be with. Number 2 refers to the next group your child prefers to be with, etc.:

Younger _______________
Own age _______________
Older children________
Adults________________
Other disabled children_______________

12. Number in order of importance the type of recreational activity most preferred by your child (number 1 being most preferred):

Read________ T.V.__________ Movies__________ Play indoors _________

Games_______ Visit relatives___________ Play sports _____________

Sightseeing__________ Others (list) ____________________________

13. How is his overall school work? (Circle one)

	Excellent				Poor
	A	B	C	D	F

What are his grades in specific subjects?

Reading	A	B	C	D	F
Spelling	A	B	C	D	F
Arithmetic	A	B	C	D	F
Others:					
____________	A	B	C	D	F
____________	A	B	C	D	F

13A. Are you satisfied that he is working up to capacity? ________________

14. Have you had to move closer to school because of your child's physical problems? ________________________.

15. Does your child use:

	School	Home
wheelchair	Yes or no _____	Yes or no _____
crutches	_____	_____
braces	_____	_____

16. What do you feel are the strong and weak points in your child's school program? ____

____

____

17. In what ways do you feel the school could improve its program for educating your child? ____

____

____

18. Would you like a copy of the results of this survey? ________________

As part of the study, we are interested in more information about the educational achievements of your child. A group of educational and psychological tests have been developed with the aim of providing information that may help in planning educational programs.

If you wish your child to participate in this program, fill out the form below and return it in the stamped envelope enclosed. It should also be understood that there is no charge for participation and that appointments will be made at the convenience of both parents and child. We would appreciate it if you could specify the most convenient time for your child to be seen: ____________________ ____________________

Date Time

CONSENT FORM

I would like my child_______________________________________to participate in the Educational Evaluation Program.

____
Parent's Signature

Date__________________________________

APPENDIX D

GLOSSARY

Bricker Procedure - (Uretero-ileostomy) - used in cases in which upper urinary tract damage is impending or has already occured. This procedure diverts the ureters from the bladder and reattaches them to the terminal end of the ileum. (see figure D_1)

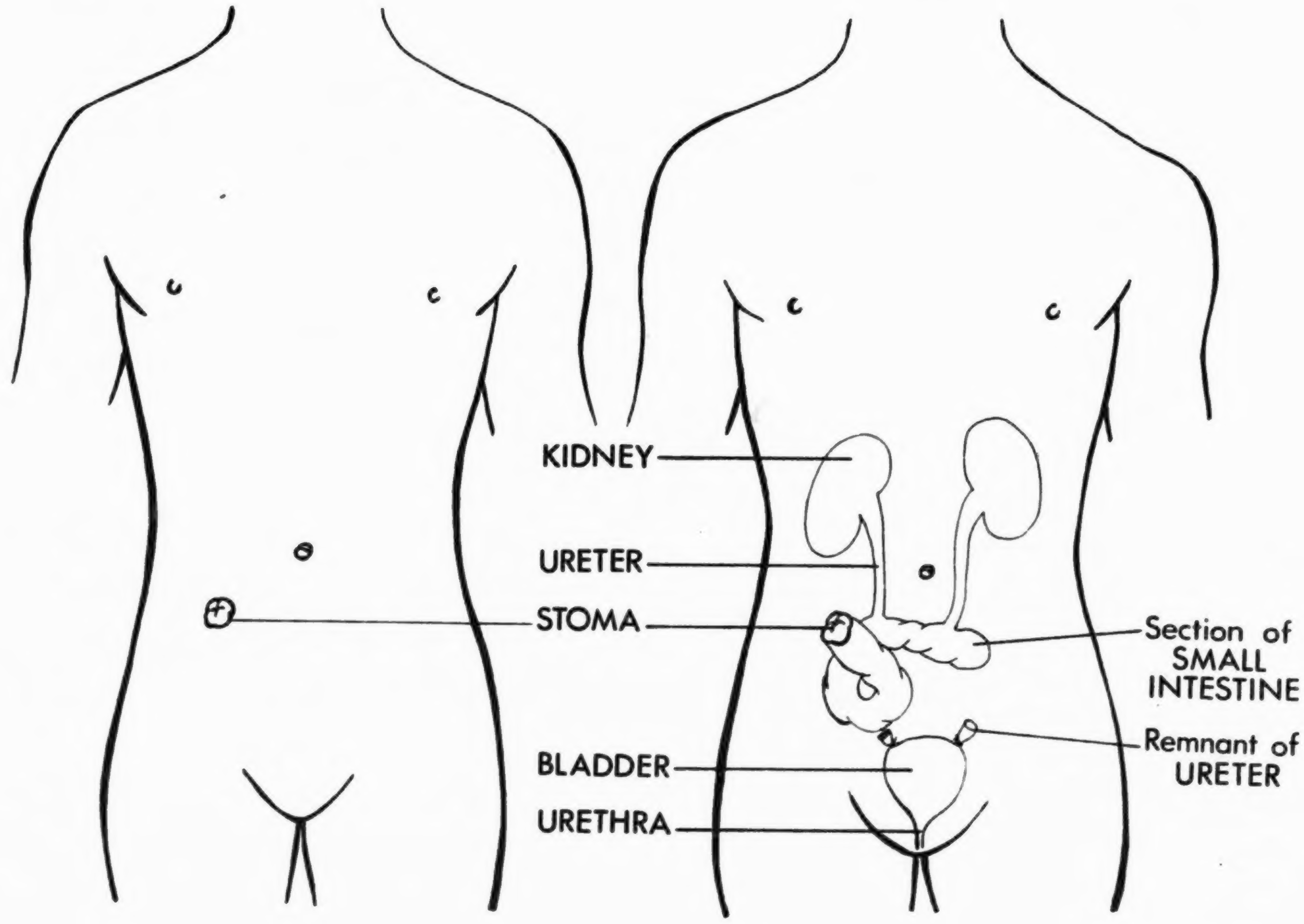


Fig. D_1

In the Bricker procedure (uretero-ileostomy), the ureters, which are detached from the urinary bladder, are inserted into one end of a segment of the small intestine (ileum). The other end of this segment is brought through the body wall, and a rubber bag is cemented to the skin over the opening. This enables the urine to drain from the kidneys into the intestinal segment, then into the rubber bag.

In the Bricker procedure (uretero-ileostomy), the ureters, which are detached from the urinary bladder are inserted into one end of a segment of the small intestine (ileum). The other end of this segment is brought through the body wall, and a rubber bag is cemented to the skin over the opening. This enables the urine to drain from the kidneys into the intestinal segment, then into the rubber bag.

CUB Appliance - (Child's Urinal bag) - A device developed for males in order to aid them to independently handle the problems associated with incontinence. A portion of the device fits over the penis and the urine drains into a collecting bag which is easy to manipulate. This device along with an appropriate voiding program allows males to achieve a dry and hygenic condition.

Hydrocephalus - A condition, usually congenital, marked by an excessive accumulation of fluid in the cerebral ventricles, dilating these vacities, thinning the brain and causing a separation of the cranial bones. This condition results in an excessive enlargement of the head.

Spina Bifida - A birth defect of the skeletal system in which the dorsal plates of certain vertebrae (usually lower back) fail to cover the spinal cord. (Figure D$_2$).(Figure D$_3$).

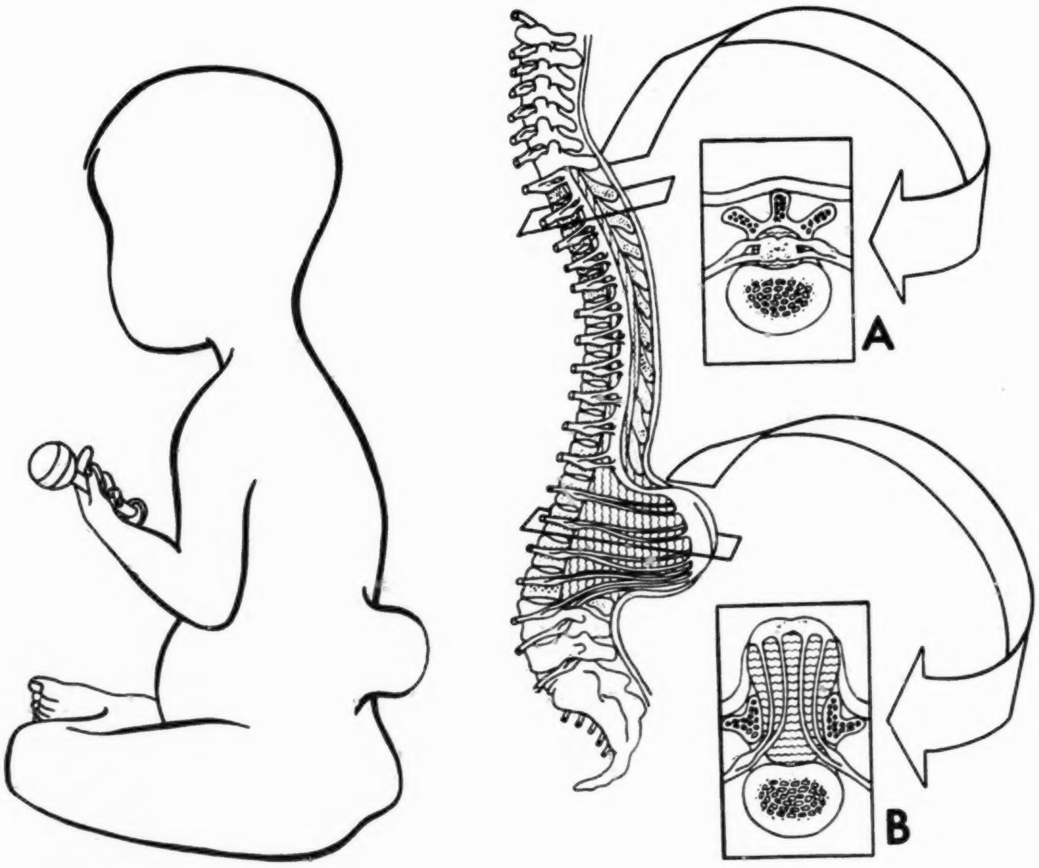


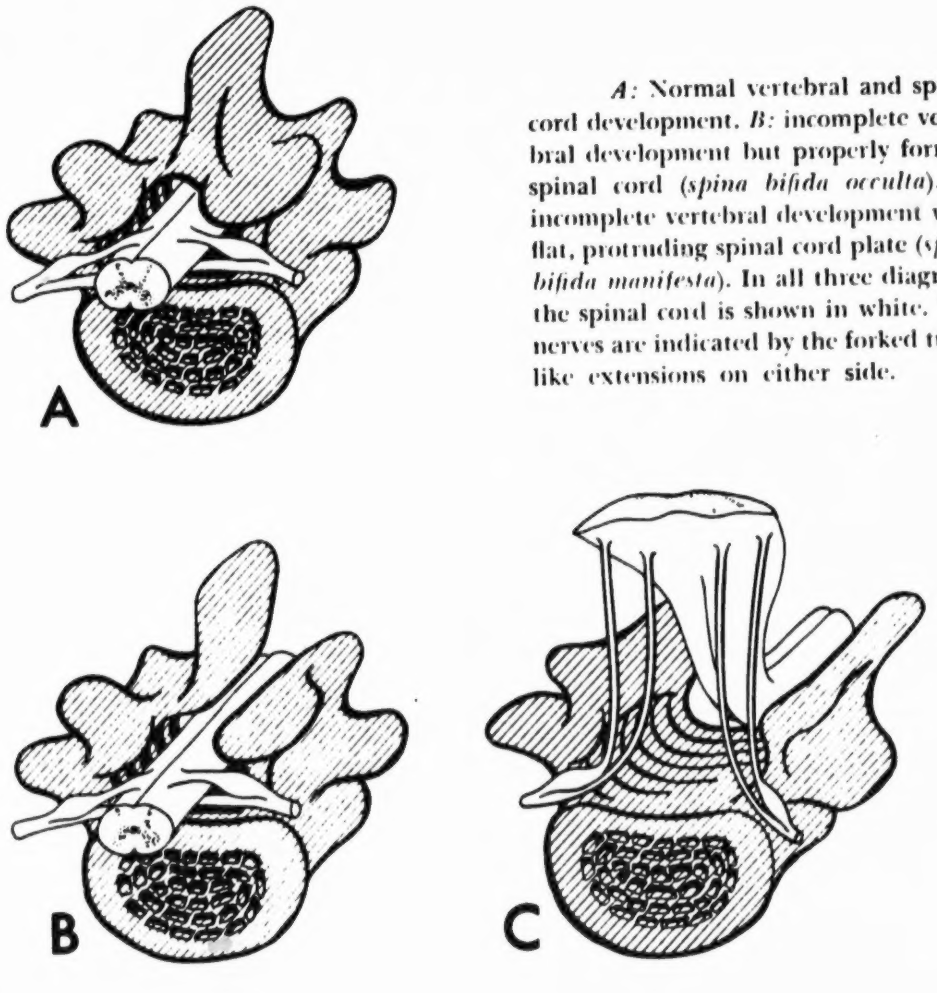
Figure D$_2$

The diagram on the right illustrates the vertebral column and spinal cord of the baby shown on the left. A: Cross-section of the normal upper part of the spine. B: Cross-section of the lower part of the spine showing incompletely developed vertebra and spinal cord.

Spina Bifida Occulta - Some of the vertebrae are incompletely developed, however the spinal cord is normal, the skin is normal and there is no protrusion on the back. This condition occurs in more than 20 per cent of all the births and rarely results in difficulty. It is detectable by x-ray examination.

Spina Bifida Manifesta-A condition in which the vertebral defect is visible because the skin meninges and or spinal cord protrude between defective spines.

Myelomeningocele - A developmental defect of the spinal cord, in which the malformed cord protrude between defective vertebrae. It may be covered with skin, meninges or uncovered. The spinal cord defect results in, muscle weakness, sensory loss, incontinence of bowel and bladder and hydrocephalus (75%) patients.



A: Normal vertebral and spinal cord development. *B:* incomplete vertebral development but properly formed spinal cord (*spina bifida occulta*). *C:* incomplete vertebral development with flat, protruding spinal cord plate (*spina bifida manifesta*). In all three diagrams the spinal cord is shown in white. The nerves are indicated by the forked tube-like extensions on either side.

Figure D3

APPENDIX E

Appendix E1: Relationship between ITPA Performance and Readiness (MAT) in the youngest age group.

SB

READINESS	VD				ME			AD			VE		
	1		2										
A	75		120		104	95		106	74		79	120	
	3	4	5										
B	80	75	94		120	42	120	77	77		72	72	120
C	57	66			82	120		120	120		88	64	
D	80	66	57		35	60	65				61	42	50
	44	53	57	66	46	36	63	39	74	65	57	42	57
E	62				65			53	49	71	44		
	57	36	36		70	30	55				36	76	53

AMP
ITPA

READINESS	VD			ME			VE		AD		
A	94	7		120	95		120	86	120	120	
B	120	57		104	76		61	76	120	120	
C	80			70			76		120		
D	57	53	49	80	70	60	72	80	63	68	81
	75	53	57	38	65	55	61	49	77	56	57
							79	38			
E	32			46			38		90		

Appendix E2: Test-Retest correlations by 2 Investigators

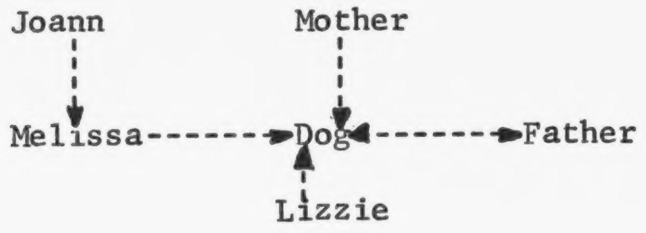
Variable	Ours R	Quereshi's R
Information	.67	.77
Comprehension	.45	.55
Arithmetic	,63	.58
Similarities	.46	.62
Vocabulary	.50	.72
Digit Span	.77	.51
Total Verbal	.78	
Picture Completion	.41	.65
Picture Arrangement	.62	.49
Block Design	.74	.73
Object Assembly	.55	.59
Coding	.60	.71
Total Performance	.83	
Full Scale I.Q.	.80	

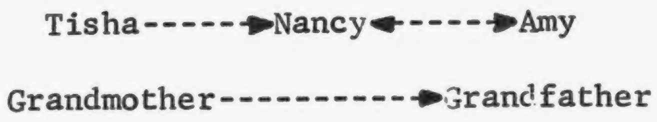
Appendix E3 : Sample Protocols from Interpersonal Recall

Name: NW Age: 6 - 11 Disability: Spina Bifida (NH)

INTERPERSONAL RECALL

	Person	Equivalent Person	Reason
1.	Amy (sister)	Nancy	Their faces
2.	Joann	Lizzie	Act alike
3.	Grandmother	Grandfather	ideas match
4.	Mother	Dog	She likes mother
5.	Father	Dog	Kisses dog, dog licks father
6.	Dog	Father	
7.	Lizzie	Dog	She has a cat and likes dogs
8.	Tisha	Nancy	Look alike
9.	Melissa	Dog	
10.	Nancy	Amy	Faces


Joann
Mother
Melissa
Dog
Father
Lizzie

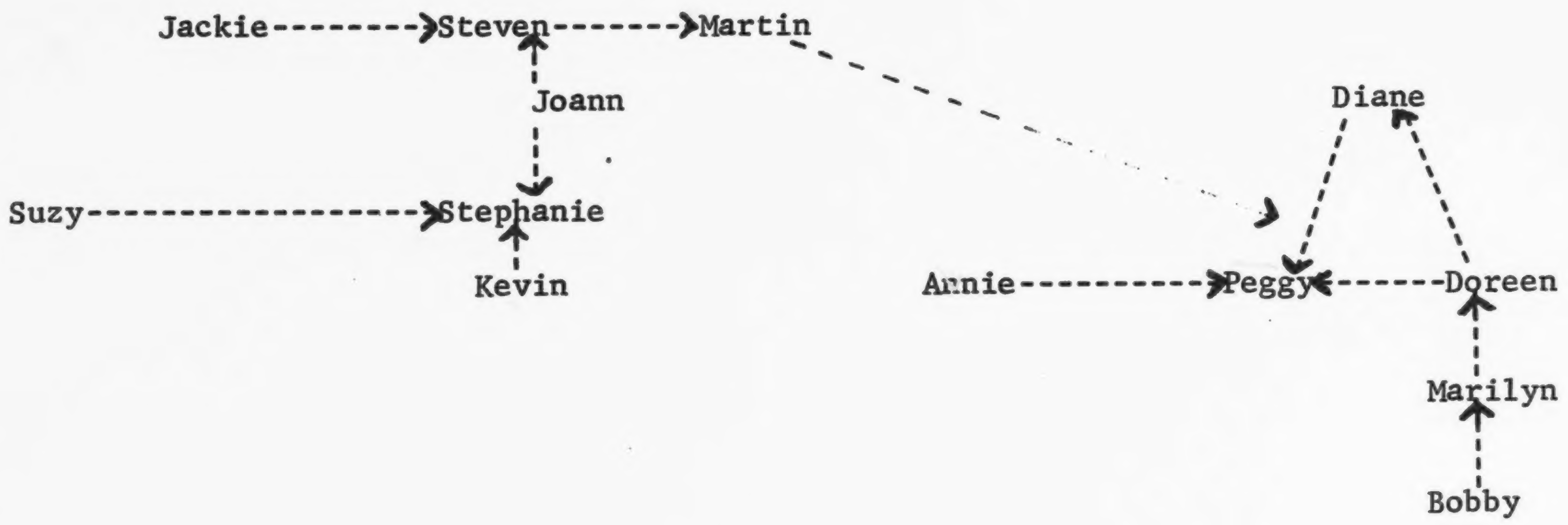

Tisha
Nancy
Amy
Grandmother
Grandfather

Appendix E3 : Sample Protocols from Interpersonal Recall.

Name: BF Age: 6 - 3 Disability: AMP'

INTERPERSONAL RECALL

Person	Equivalent Person	Reason
1. Suzy	Stephanie	Same haircut
2. Annie	Peggy	Both have blue eyes
3. Peggy	Doreen	Both have same hair
4. Stephanie	Joann	Both have blue eyes
5. Marilyn	Doreen	Both have brown eyes
6. Jackie	Steven	Both have red hair
7. Joann	Steven	Both have blond hair
8. Bobby	Marilyn	Both have blue eyes
9. Steven	Martin	Both have black hair
10. Martin	Peggy	Both have black hair
11. Kevin	Stephanie	Brown eyes
12. Diane	Peggy	Like her sister Diane
13. Doreen	Diane	


Jackie
Steven
Martin
Joann
Diane
Suzy
Stephanie
Kevin
Annie
Peggy
Doreen
Marilyn
Bobby

Appendix E3 : Sample Protocols from Interpersonal Recall

Name: JP Age: 7 Disability: Spina Bifida (H)

INTERPERSONAL RECALL

Person	Equivalent Person	Reason
1. Teacher	Everybody	None
2. Nurse	Don't know	None
3. Sister Margaret Mary	Don't know	None
4. Arts and Crafts lady	Don't know	None
5. Miss Macow	Don't know	None

Appendix E4: Selected Questionnaire Data

Type of School - Crutches at Home

		Yes	No	
		1	2	
Special School	1	5	5	10
Normal School	3	9	18	27
Special Class	4	5	6	11
Home Instruction	5	0	1	1
		19	30	49

$X^2 = 1.518$

N.S.

Appendix E4: Selected Questionnaire Data

Type of School - Wheelchair at Home

		1	2	
Special School	1	6	5	11
Normal School	3	6	21	27
Special Class	4	3	8	11
Home Instruction	5	1	0	1
		16	34	50

Appendix E4 : Selected Questionnaire Data

Type of School - Management of Bladder

		1 No Problem	2 Problem-Handles Self	3 Requires help in school	4 Come home for Assistance
Special School	1	1	3	5	2
Normal School	3	6	15	6	2
Special Class	4	6	2	4	0
Home Instruction	5	0	1	0	0
		13	21	15	4

$X^2 = 13.467$

sig. at. .01

Appendix E4: Selected Questionnaire Data

Type of School - Bowel Accidents

		Less Than Once a Month (1)	Once a Month (2)	Once a Week (3)	Daily (4)	No (5)	
Special School	1	3	0	3	4	0	10
Normal School	3	13	6	4	1	3	27
Special Class	4	5	3	1	2	0	11
Home Instruction	5	0	0	0	0	1	1
		21	9	8	7	4	49

N.S.

Appendix E4: Selected Questionnaire Data

Type of School - Wheelchair at School

	1	2	
Special School 1	6	5	11
Normal School 3	7	21	28
Special Class 4	1	10	11
Home Instruction 5	1	0	1
	15	36	51

$X^2 = 6.438$ Sig. at .10

Appendix E4 : Selected Questionnaire Data

Type of School - Crutches at School

		Yes 1	No 2	
Special School	1	5	4	9
Normal School	3	9	19	28
Special Class	4	6	5	11
Home Instruction	5	0	1	1
		20	29	49

N.S.

Appendix E4: Selected Questionnaire Data

Type of School - Braces at School

		Yes	No	
Special School	1	5	5	10
Normal School	3	16	12	28
Special Class	4	6	5	11
Home Instruction	5	0	1	1
		27	23	50

N.S.

Appendix E4: Selected Questionnaire Data

Type of School - Braces at Home

		Yes	No	
Special School	1	7	2	9
Normal School	3	15	12	27
Special Class	4	5	6	11
Home Instruction	5	0	1	1
		27	21	48

N.S.

APPENDIX F

FIG. 1.

CUMULATIVE PERCENT OF READING ACHIEVEMENT—MAT
(AVERAGE OF WORD KNOWLEDGE, WORD DISCRIMINATION AND READING IN 2 OLDEST GROUPS, AND READING READINESS RATING IN YOUNGEST GROUPS)

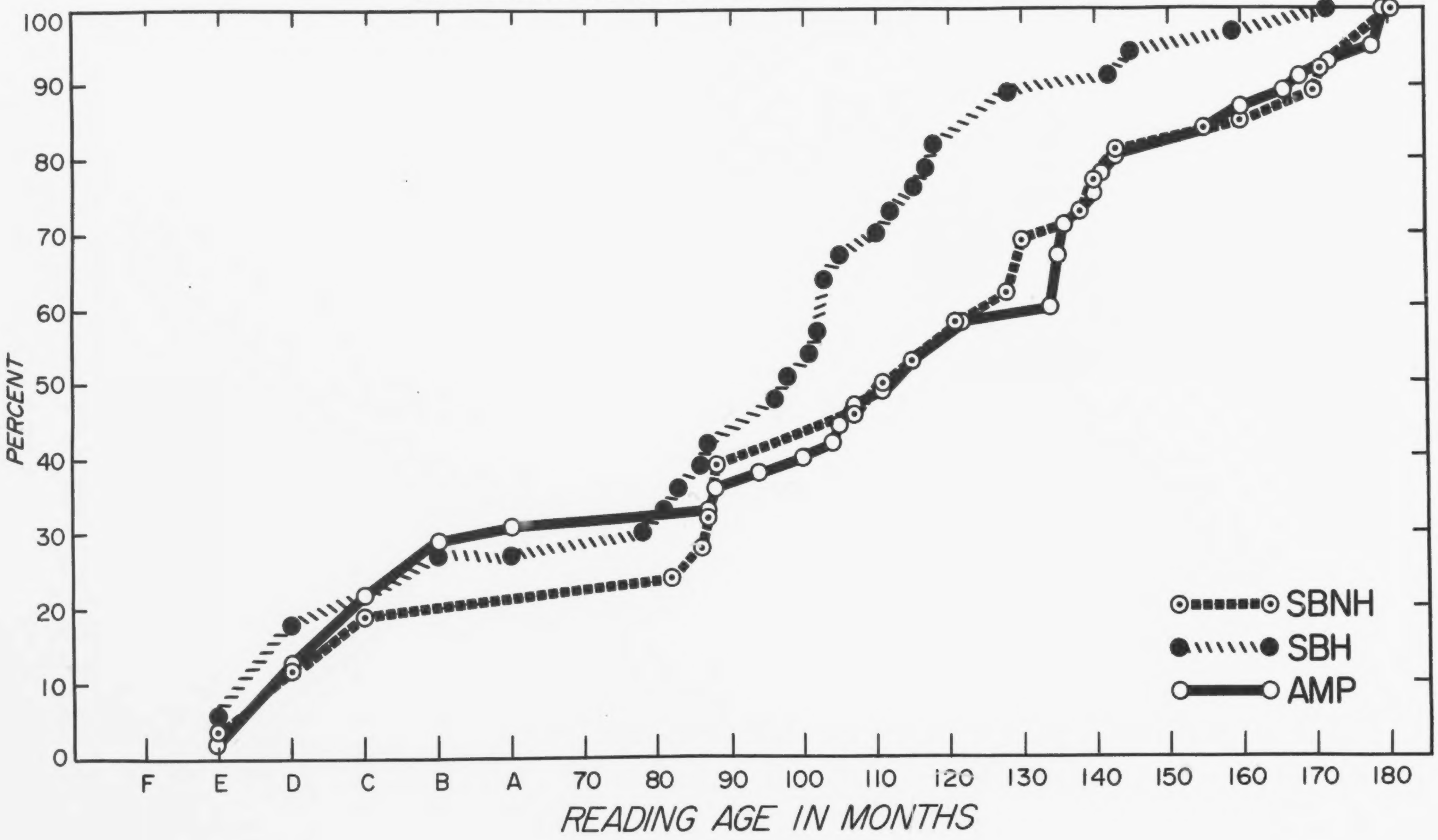
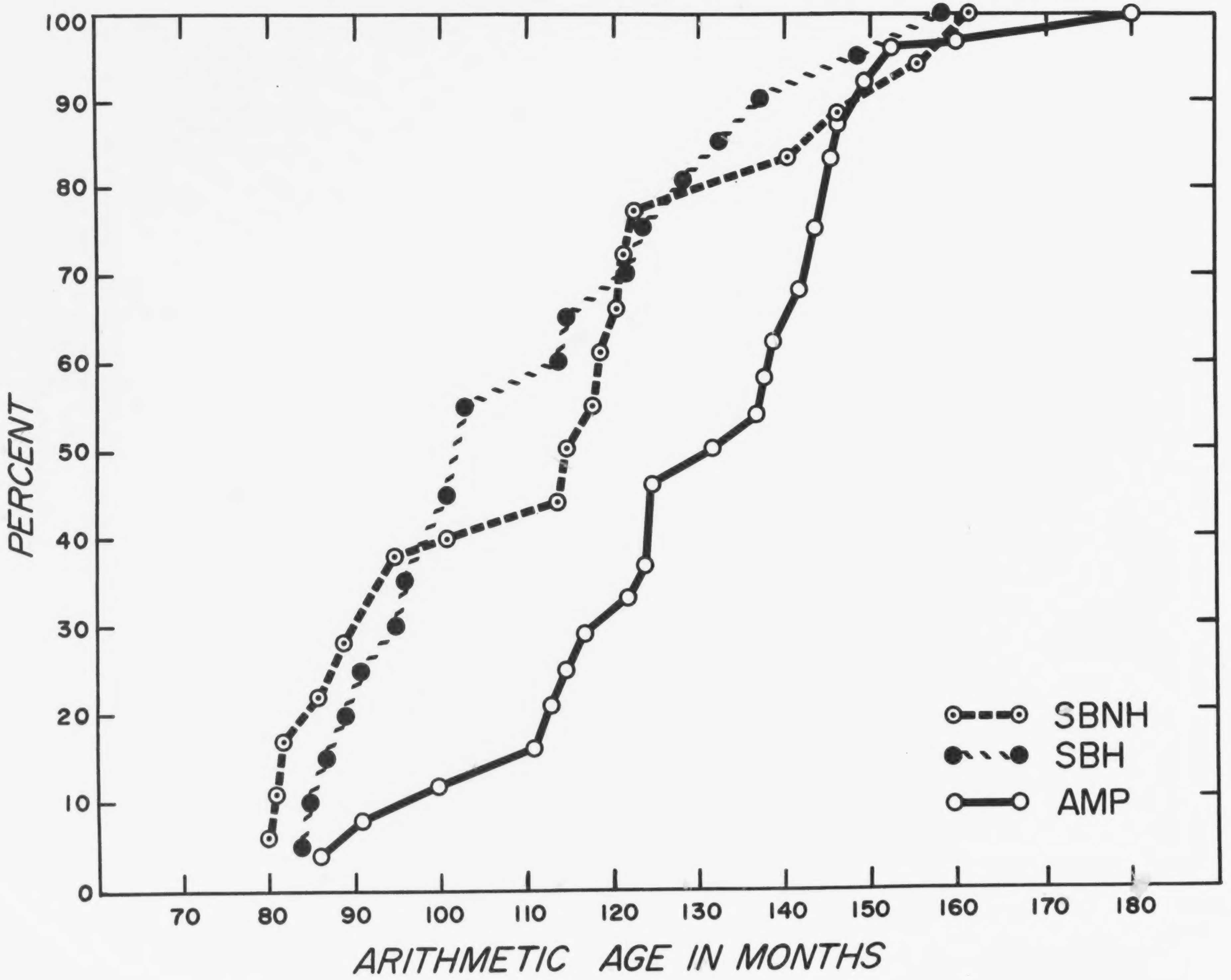


FIG. 2. CUMULATIVE PERCENT OF ARITHMETIC ACHIEVEMENT–MAT

(AVERAGE OF ARITHMETIC COMPUTATION AND ARITHMETIC PROBLEM SOLVING IN 2 OLDEST GROUPS)



QUARTILE PLOT OF MAT READING SCORES FOR 3 AGE GROUPS

(AVERAGE OF WORD KNOWLEDGE, WORD DISCRIMINATION AND READING IN OLDEST 2 GROUPS, AND READING READINESS RATING IN YOUNGEST GROUP)

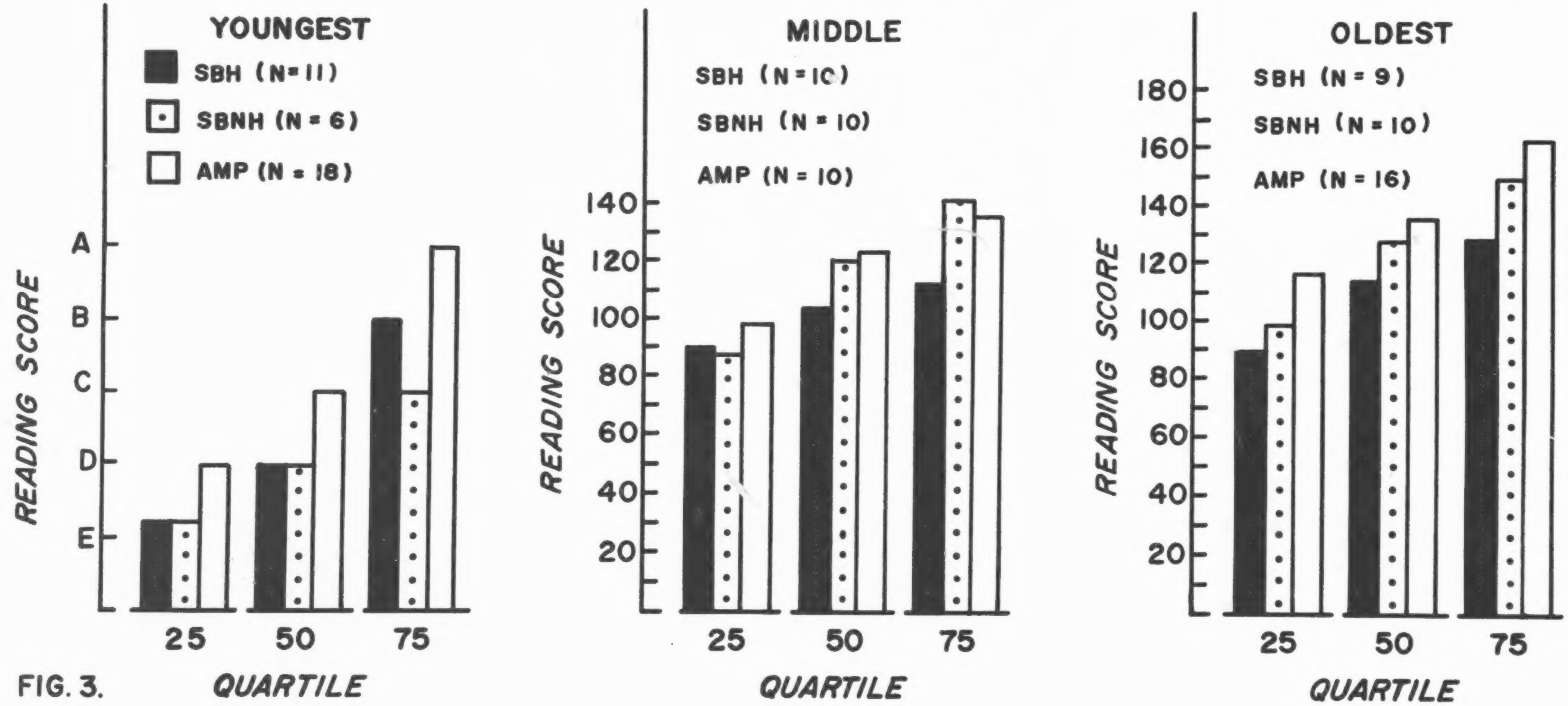
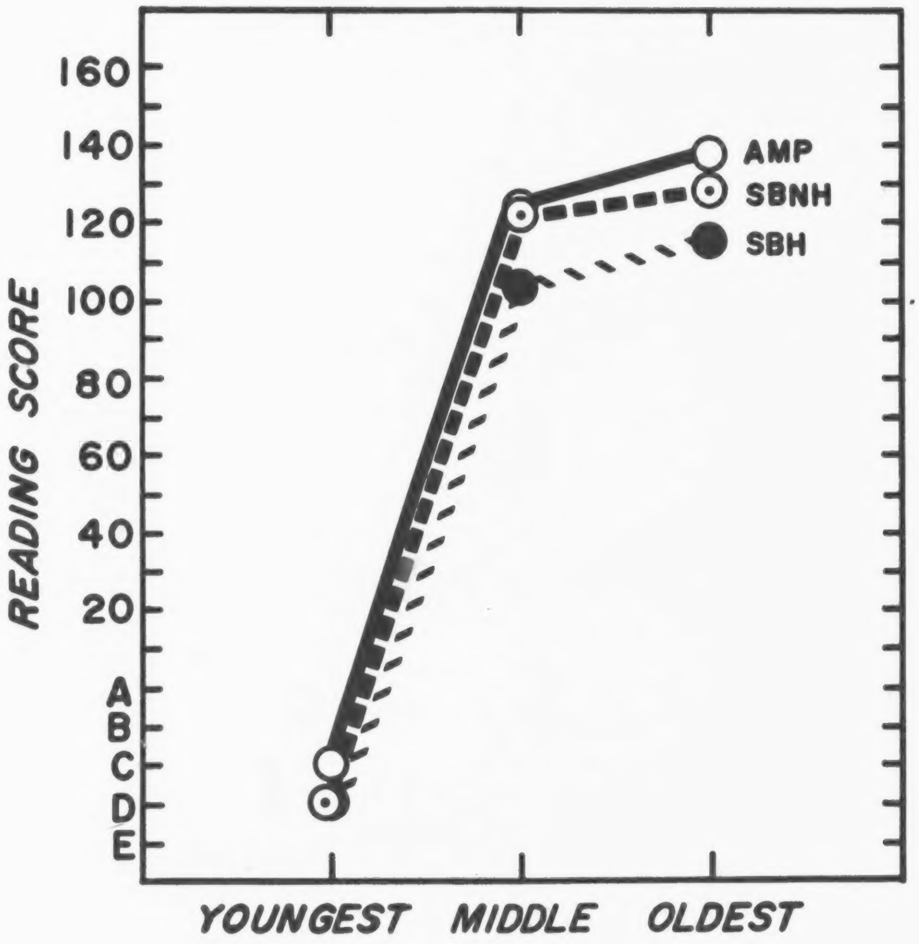


FIG. 3.

FIG. 4. MEDIAN READING SCORE MAT FOR EACH OF THREE AGE GROUPS



QUARTILE PLOT OF MAT ARITHMETIC SCORES FOR 3 AGE GROUPS

(AVERAGE OF ARITHMETIC COMPUTATION AND ARITHMETIC PROBLEM SOLVING IN 2 OLDEST GROUPS, AND READINESS RATING IN YOUNGEST GROUP)

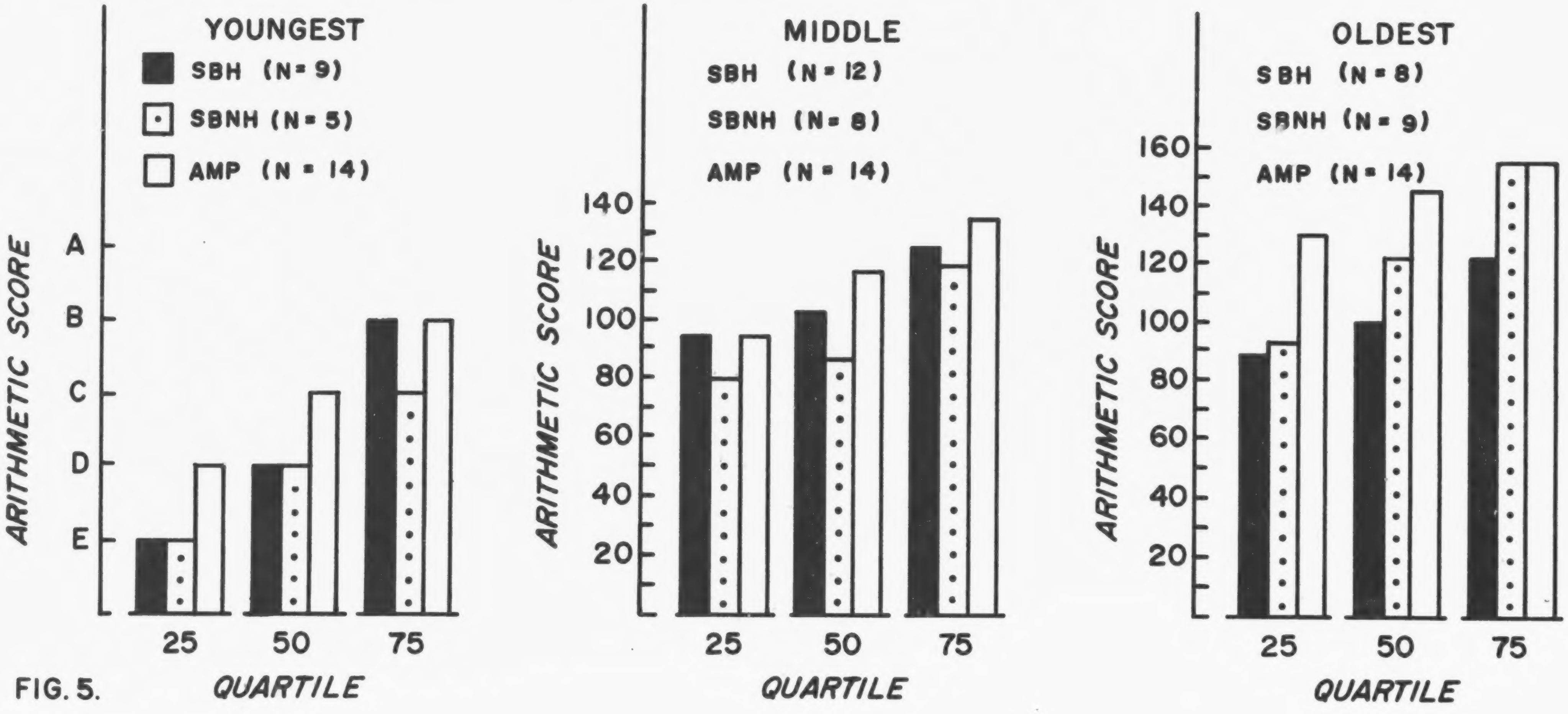
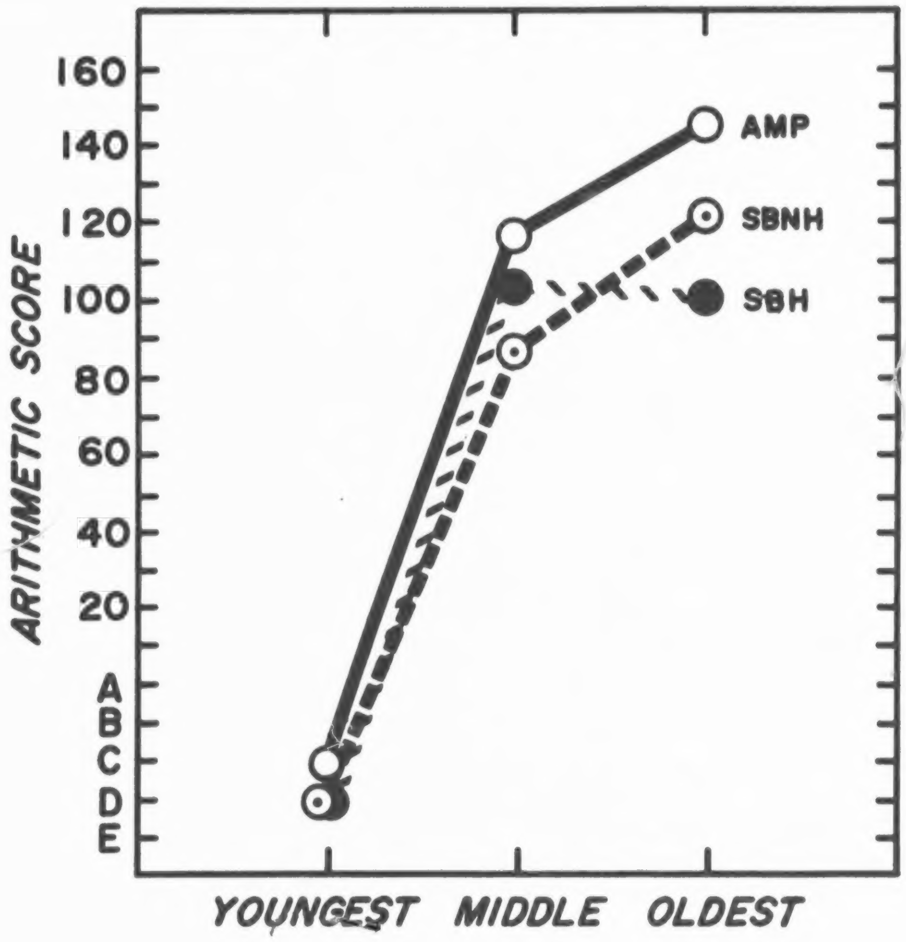


FIG. 5.

FIG. 6. MEDIAN ARITHMETIC SCORE MAT FOR EACH OF THREE AGE GROUPS



MEAN PERFORMANCE ON 5 SUBTESTS OF MAT – 3 GROUPS

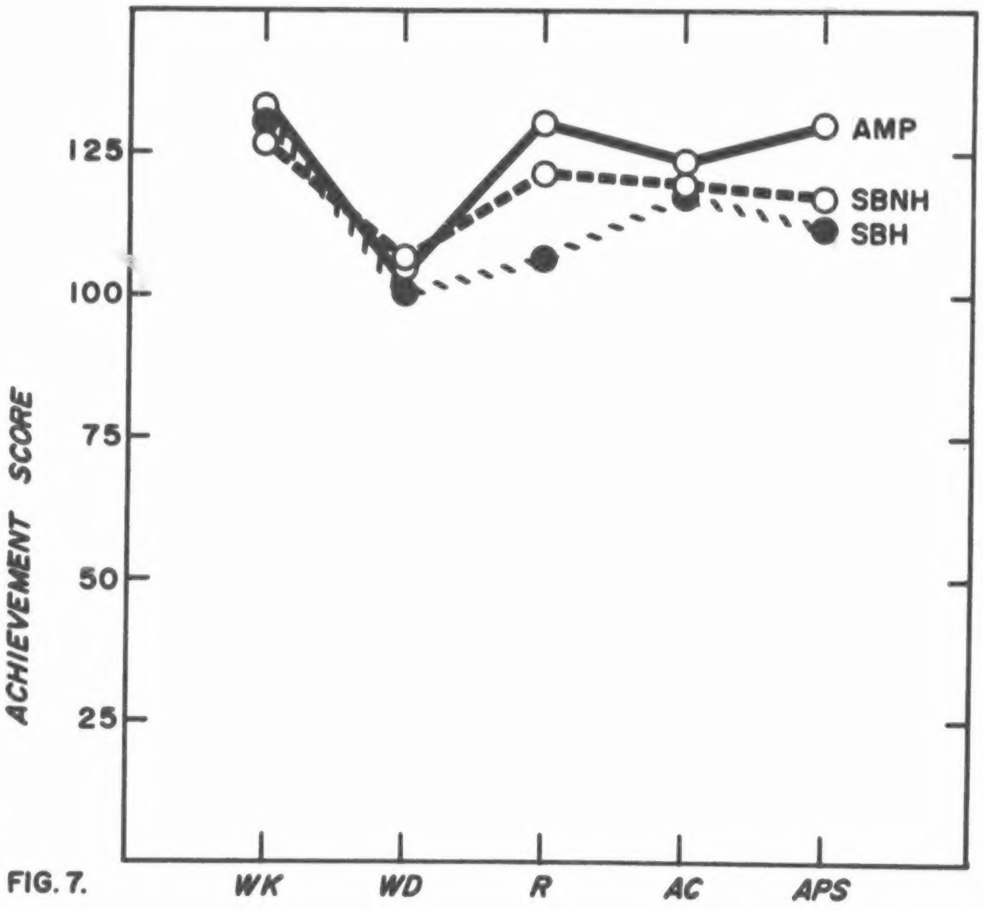


FIG. 7.

MEAN PERFORMANCE ON 4 ITPA SUBTESTS — 3 GROUPS

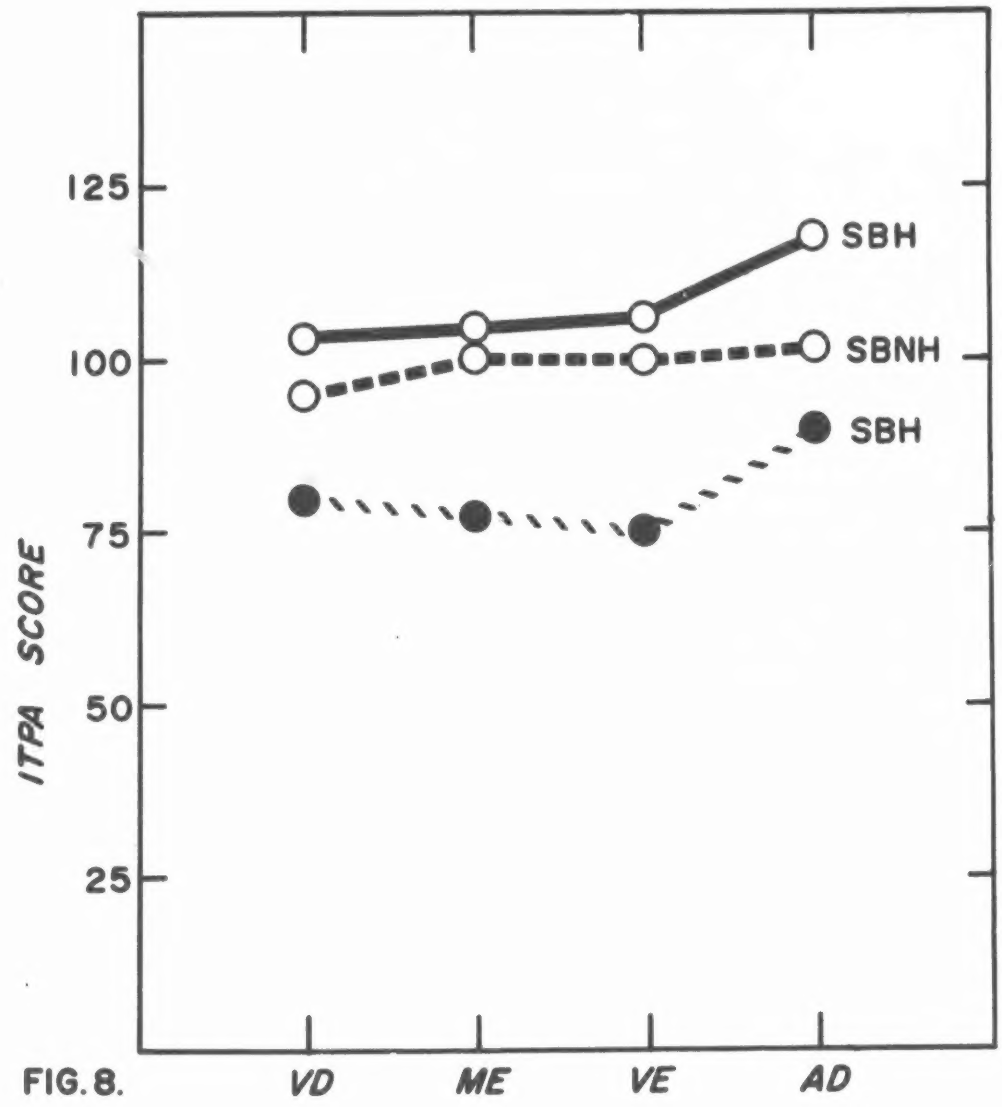


FIG. 8.

FIG. 9. DEVELOPMENTAL TRENDS IN ITPA PERFORMANCE I

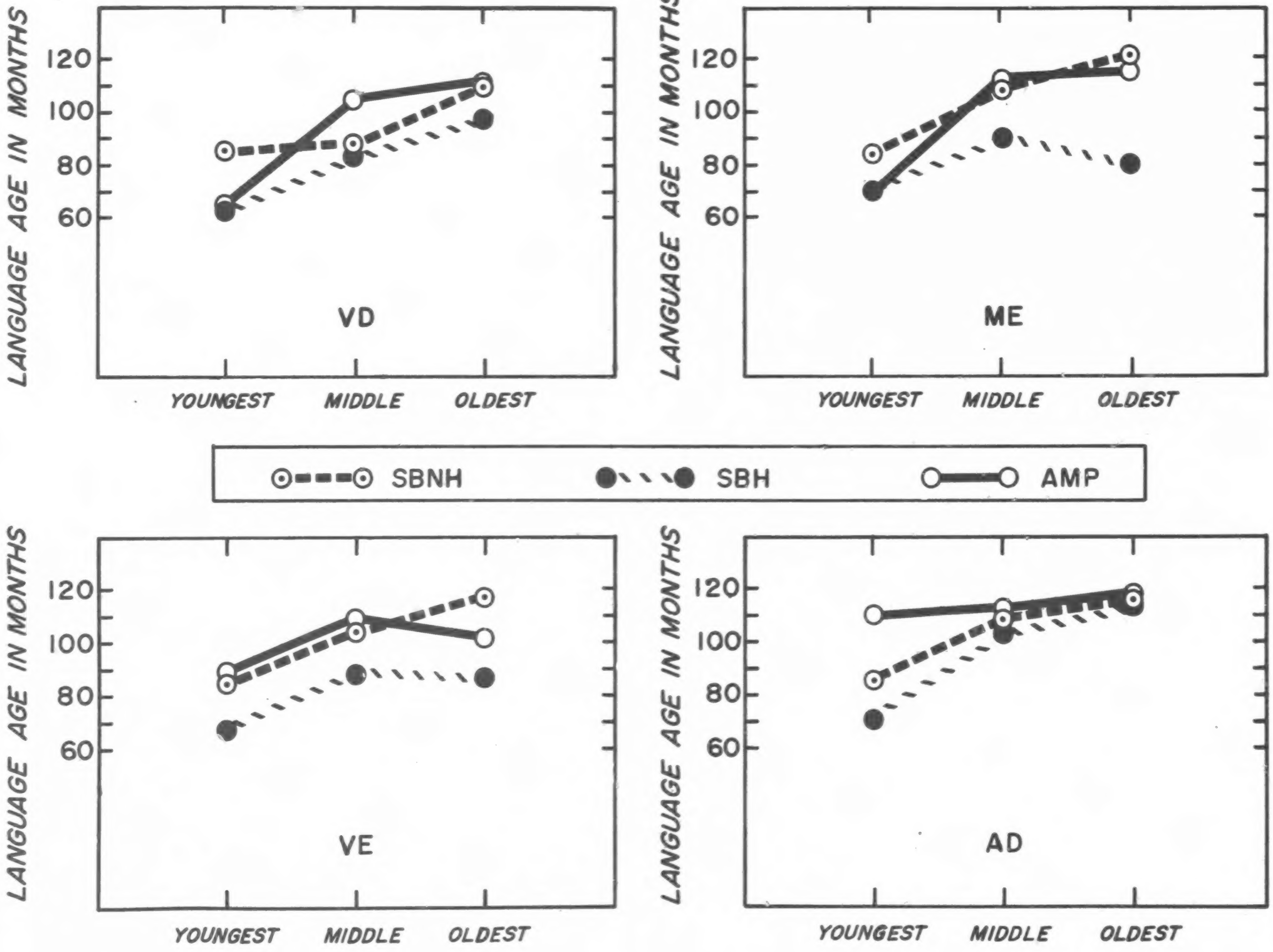
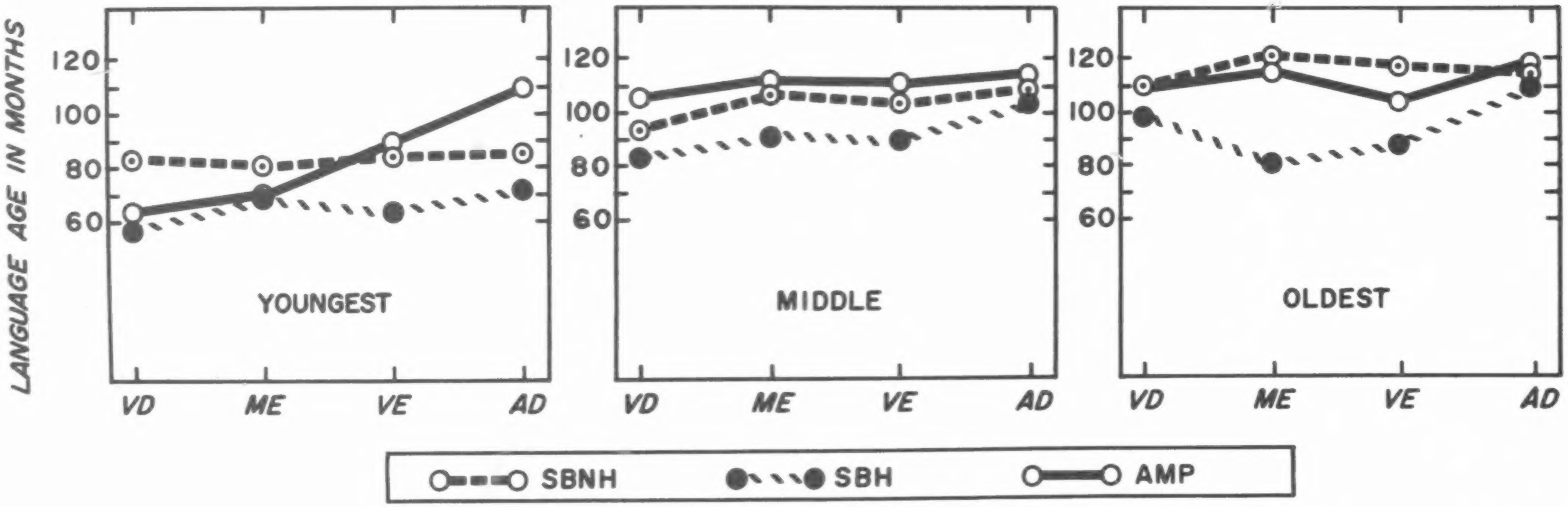


FIG. 10.

DEVELOPMENTAL TRENDS IN ITPA PERFORMANCE II



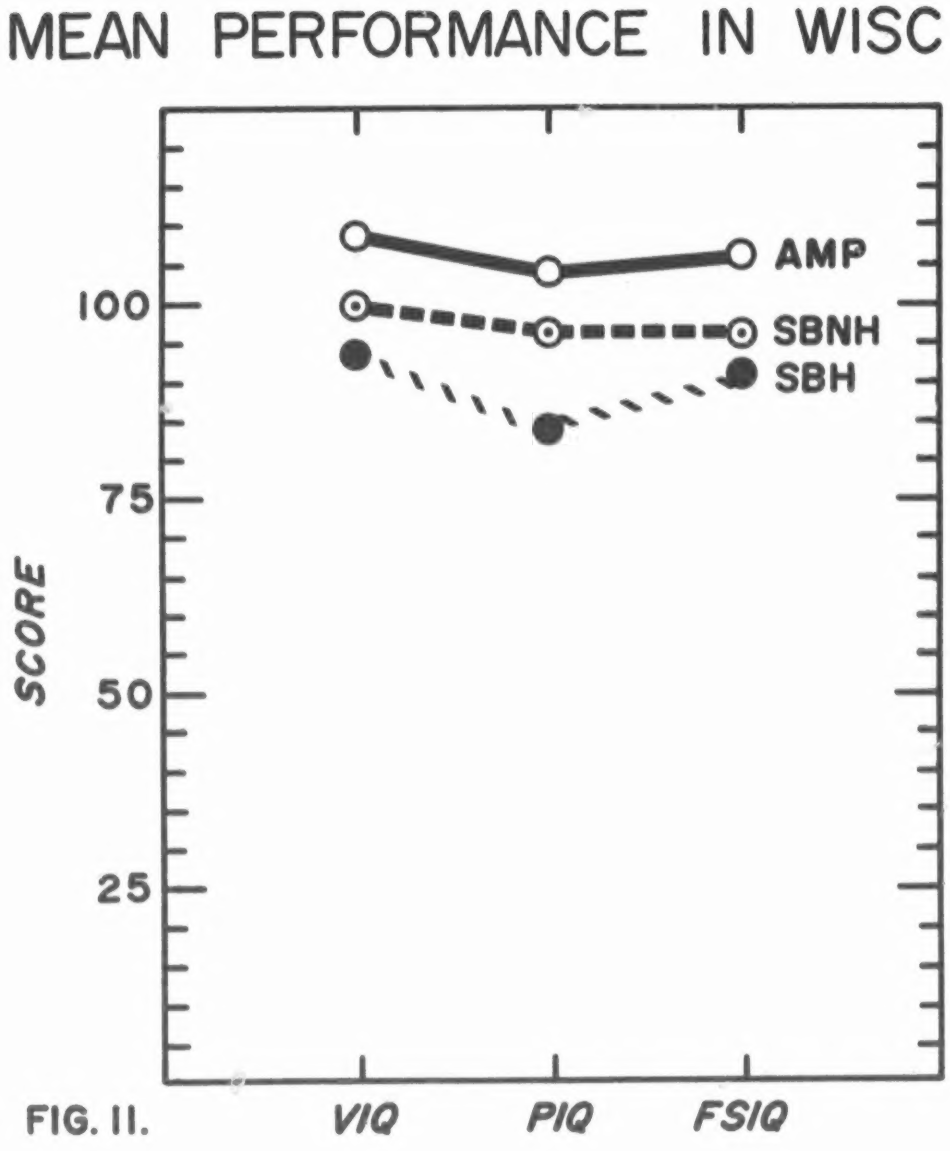
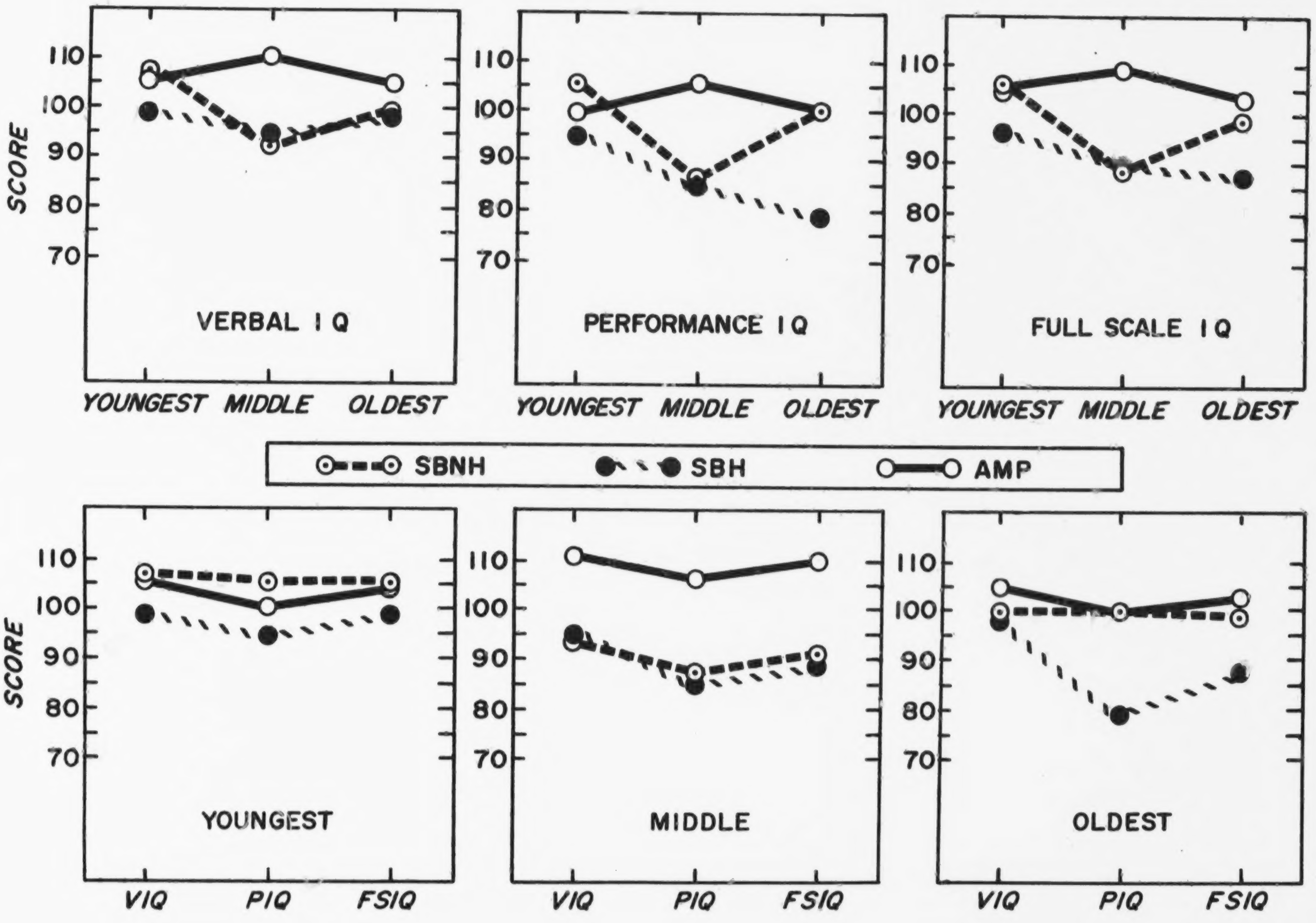

MEAN PERFORMANCE IN WISC
SCORE
100
75
50
25
AMP
SBNH
SBH
VIQ
PIQ
FSIQ

FIG. II.

3

FIG. 12. DEVELOPMENTAL TRENDS IN WISC PERFORMANCE



NUMBER OF ASSOCIATIONS FOR 4 DIFFERENT CONTENT AREAS IN 3 GROUPS OF DISABLED CHILDREN

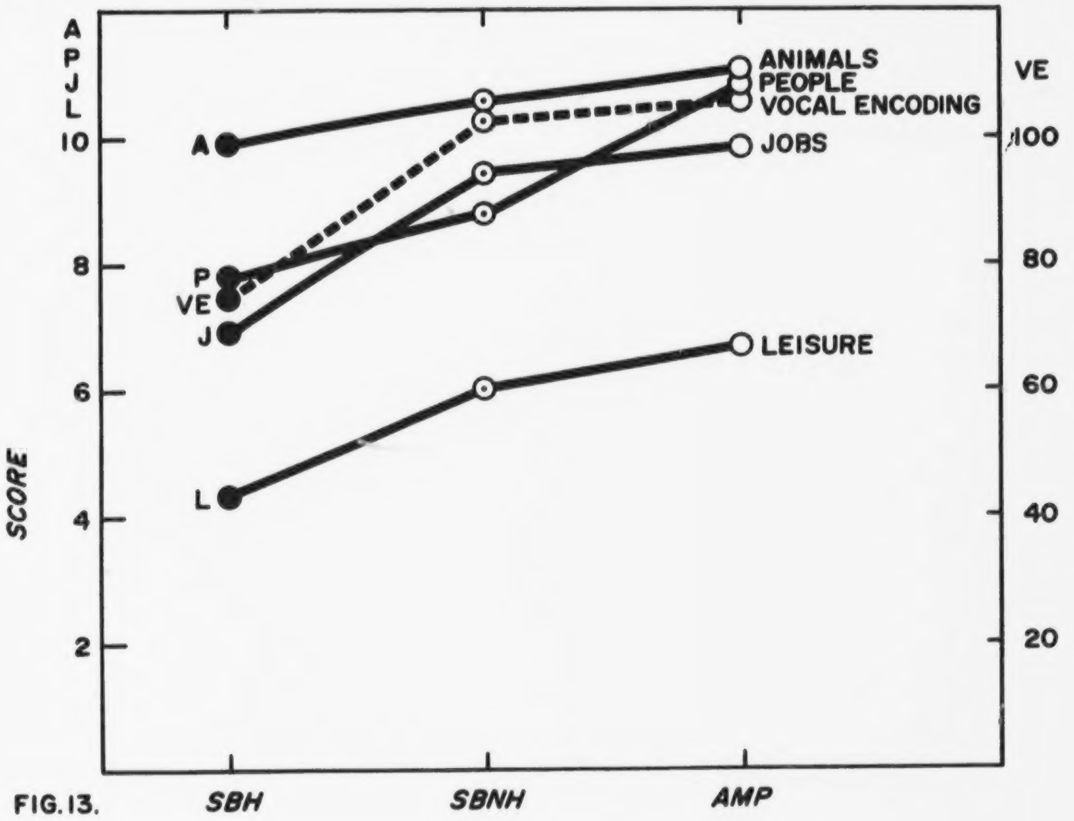


FIG. 13.

FIG. 14. INTERPERSONAL RECALL AS A FUNCTION OF AGE

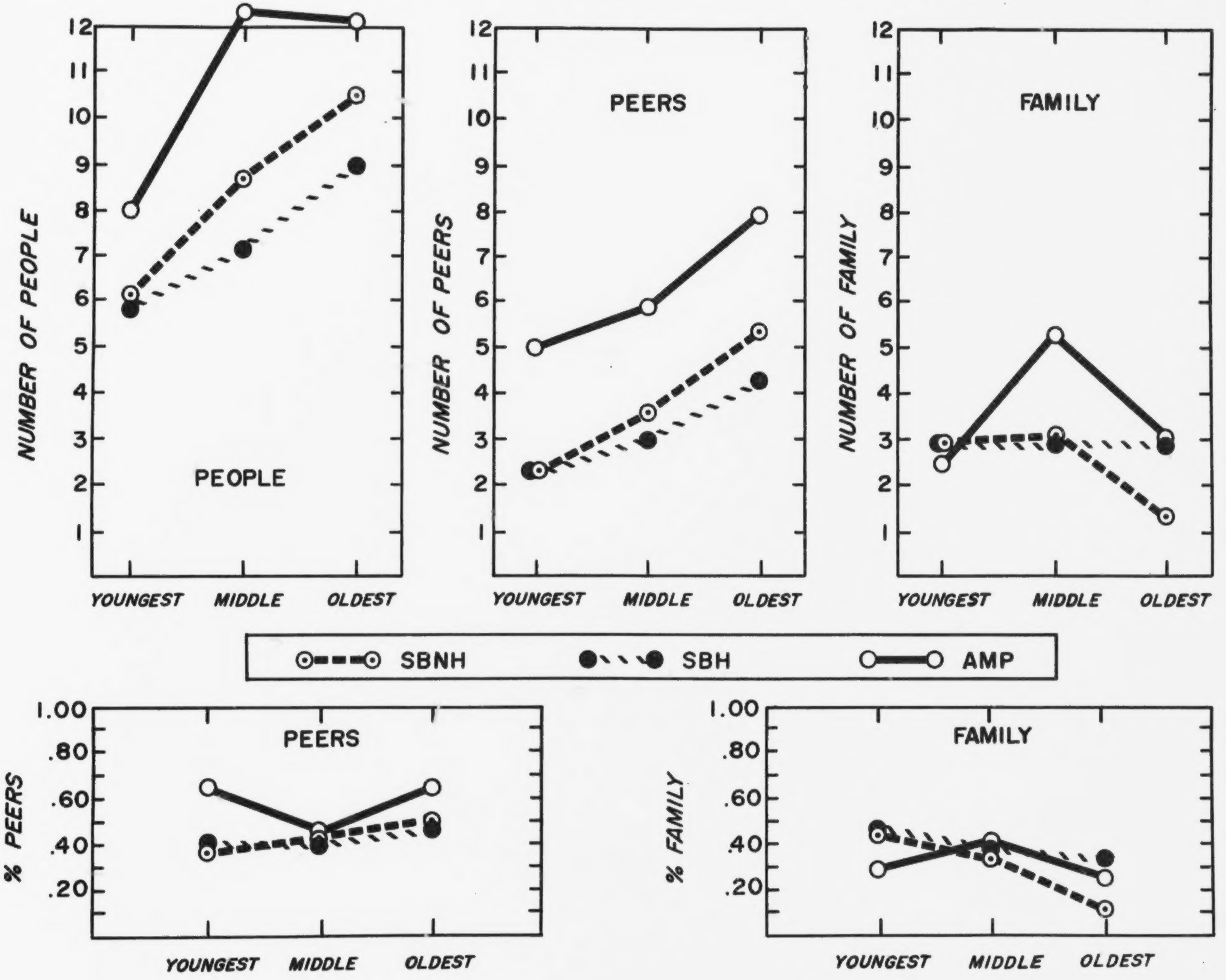
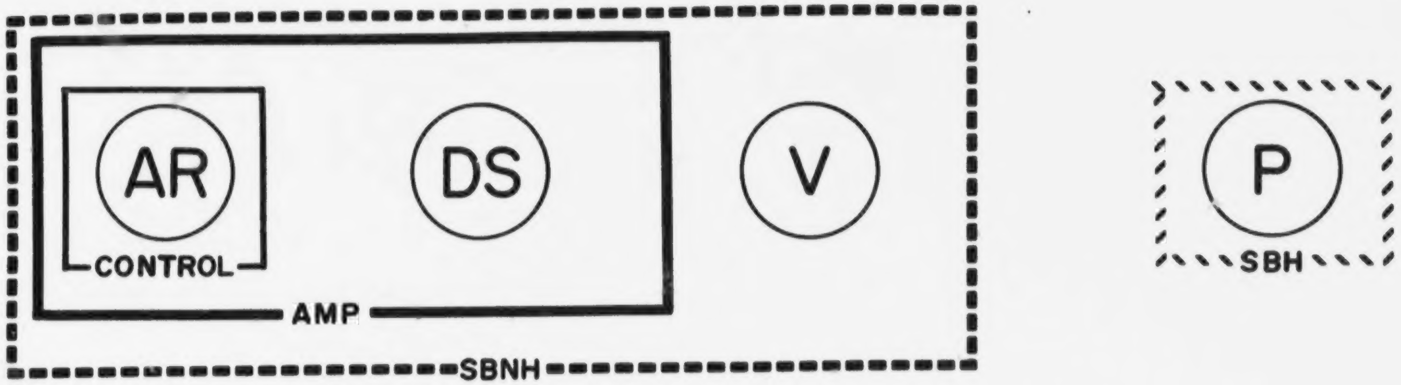


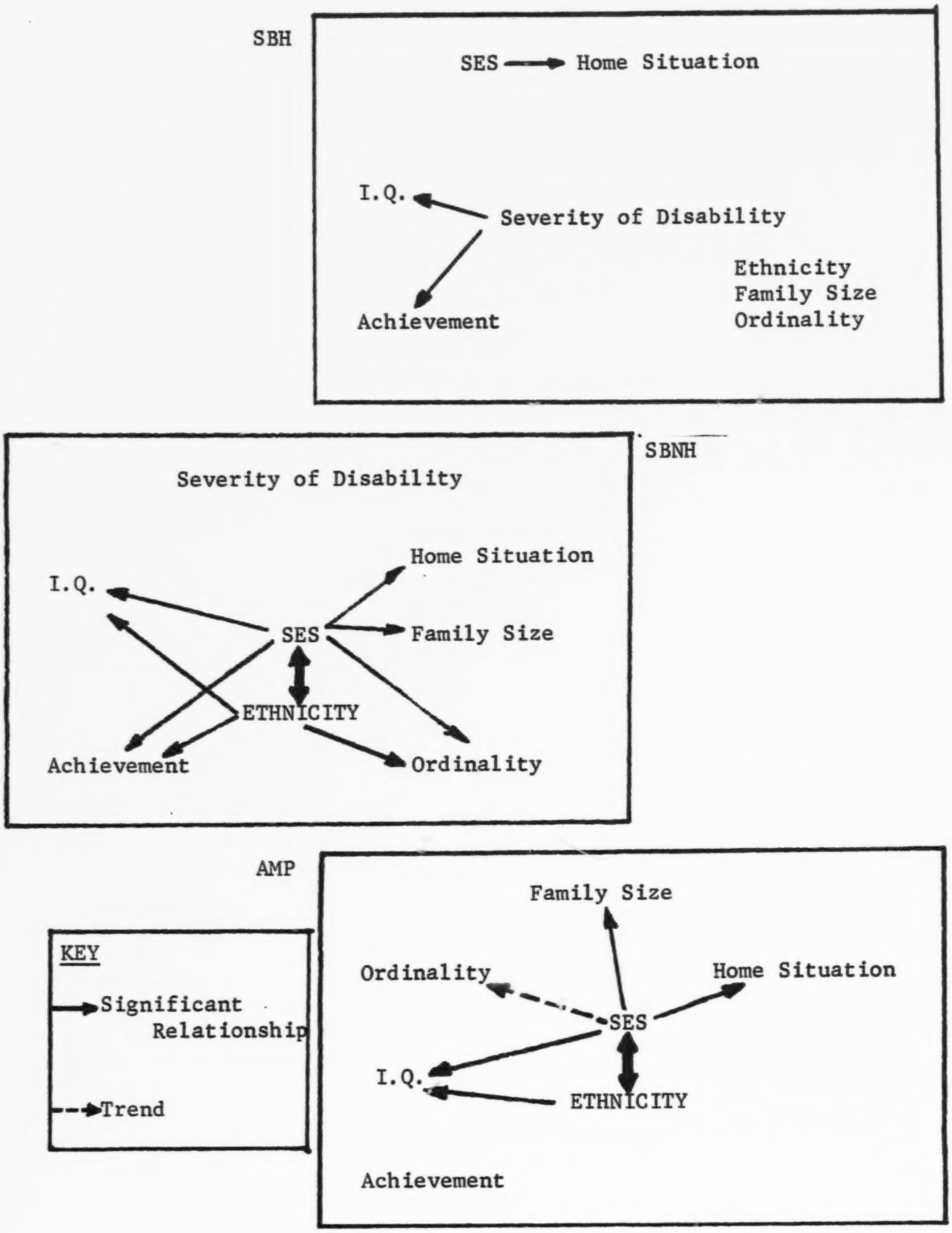
FIG. 15. ILLUSTRATION OF OVERLAP OF CORRELATES *

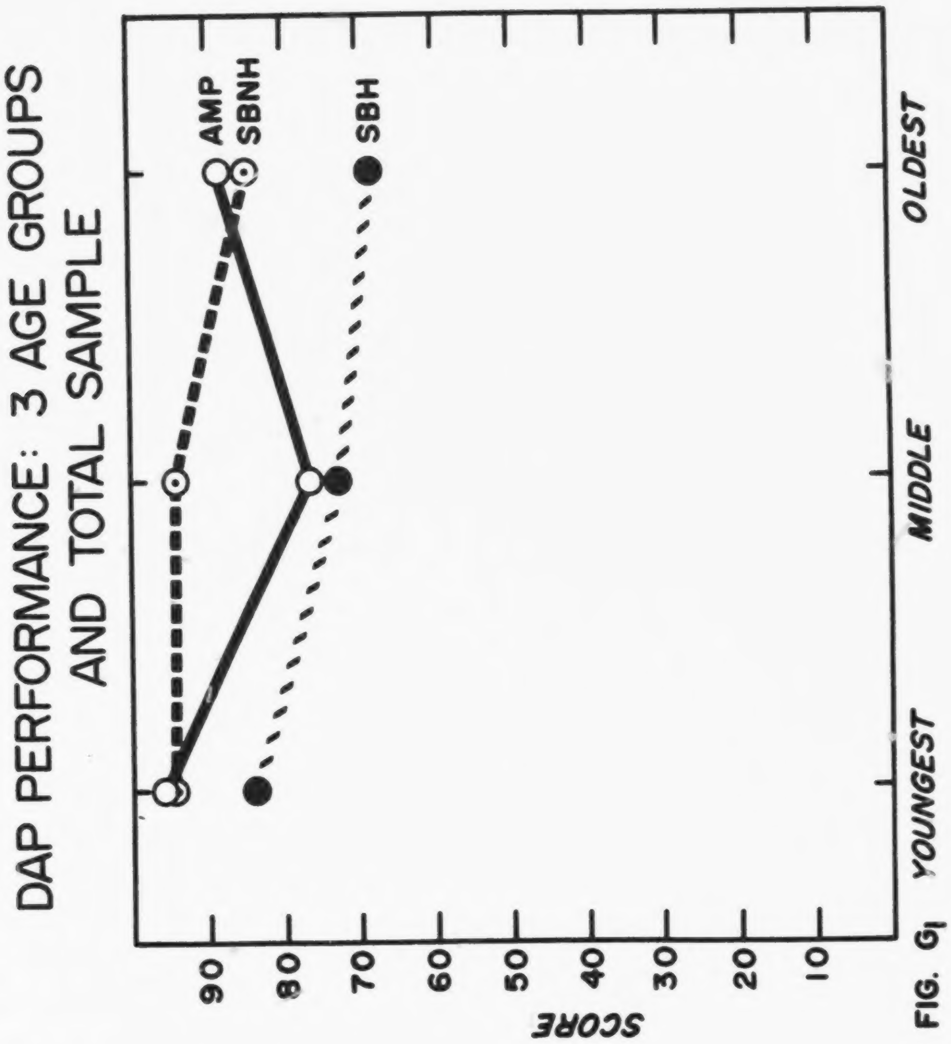

AR
CONTROL
DS
AMP
V
SBNH
P
SBH

AR = ARITHMETIC AND READING DS = DIGIT SPAN V = VERBAL INTELLIGENCE
P = PERFORMANCE INTELLIGENCE

* of clusters.

Figure 16: Scheme of interactions of SES, ethnicity, disability, home situation, family size, ordinality, intelligence and achievement.


SBH
SES
Home Situation
I.Q.
Severity of Disability
Ethnicity
Family Size
Ordinality
Achievement
SBNH
Severity of Disability
Home Situation
I.Q.
SES
Family Size
ETHNICITY
Achievement
Ordinality
AMP
Family Size
Ordinality
Home Situation
SES
I.Q.
ETHNICITY
Achievement
KEY
Significant Relationship
Trend



DAP PERFORMANCE: 3 AGE GROUPS AND TOTAL SAMPLE

FIG. G1

APPENDIX G

Frostig Developmental Test of Visual Perception

In this substudy we are concerned with 3 problems: 1) Does the Frostig Developmental test of Visual Perception (FDTVP) differentiate between SBH and SBNH children? 2) Does the FDTVP differentiate between a sample of SBH and adult hemiplegics? 3) Are there different correlates of perceptual quotient for the SBH and SBNH groups?

1) Differences between SBH and SBNH

17 SBNH and 37 SBH were administered the FDTVP. The derived Perceptual Quotient did not differentiate between our 2 spina bifida groups (SBH: M= 74.9, SD=16.7; SBNH: M=74.6, SD=21.8). There were also no differences between the various subtests. This finding is surprising in light of the evidence we have presented indicating differences between the SBH and the SBNH groups. However it might be explained by the fact, that due to the time necessary to administer this test it is only given to those children in whom a perceptual problem is being evaluated. Thus while SBH children routinely administered the FDTVP the SBNH children we are dealing with in this substudy might be considered an extreme group. It might be indicated that the perceptual problems found in the SBNH are not so pervasive that they interfere with functioning in other domains.

2) SBH vs Adult Hemiplegics

We decided to juxtapose the scores received by our SBH subjects with a sample of both right and left hemiplegics (RH, LH). We are actually comparing two groups of brain injured people. One injured from birth, the other injured later in life. Previous studies (Diller and Weinberg, 1962, 1968) in our setting have indicated that the selective impairments in RH is aphasia and in LH it is perceptual-motor performance. Therefore we compared the scores received by our SBH group on the Form Constancy Subtest with those obtained by 67 LH patients and 67 RH patients. This subtest was chosen for two reasons: (a) It is the most perceptually oriented subtest in the test. (b) It is the one subtest in the Frostig which lends itself to be scored for both errors of omission and errors of comission. Interesting there were no differences between the performance of the SBH and RH on this task. There were differences between the SBH and LH (Table G_1).

Table G_1: Differences between SBH and RH on Form Constancy Subtest of Frostig

	N	M	SD		df	t	p
SBH	37	7.1	2.5	Correct A	78	3.08	.01
				Correct B	78	3.62	.01
RH	43	7.5	3.9	Total Correct	78	3.82	.01
				Omissions A	78	3.07	.01
LH	43	9.1	3.9	Omissions B	78	3.87	.01
				Total Omissions	78	3.97	.01
				Comissions A	78	0.37	N.S.
				Comissions B	78	0.39	N.S.
				Total Comissions	78	0.46	N.S.

Table G_2: Correlates of Perceptual Quotient

	VD	ME	VE	AD	WK	WD	Read.	Arith. Comp	Arith. Prob. Solv.
SBH	.09(28)	-.09(23)	-.17(23)	-.12(23)	.13(16)	56(9)	.04(17)	.04(17)	.28(14)
SBNH	.16(10)	.46(9)	.47(9)	-.35(11)	.42(9)	.46(8)	.41(9)	.24(9)	.37(5)

3) Correlates of Perceptual Quotient in SBH and SBNH

The differences obtained between our SBH children and the left hemiplegics might be explained by the examination of Table G_2. Although the correlates of the Perceptual Quotient in the SBNH group, are not statistically significant due to the small number of subjects, nevertheless, when looking at the correlates of ME, VE , WK, WD, and reading, the patterns of correlates in the SBNH group are strikingly different from those presented by the SBH group.

The Draw-A-Person test in children with Spina Bifida

One of the major clinical characeteristics of children with SBH might be expected to be disturbances in body image which should be manifested as disturbances on the draw a person test. Indeed the qualitative changes in the drawing can be noted, not only in the final product but in the child's approach to the task. The draw a person test has been reported to be sensitive to the presence of brain damage (Binder and Silver 1948) and a reflection of self esteem. Despite its popularity as an assesment instrument, the DAP has met with many validation problems as a measure of personality. With regard to handicapped there have been an extensive series of studies with mixed results. Typical of these studies is that of Wysocki and Whitney (1965) who found that handicapped children tend to express more aggression and that the aggression differs according to the area of insult so that the DAP is a useful diagnostic instrument. Equally typical is the study by Centers and Centers (1963) which found that the DAP cannot distinguish between the drawings of handicapped and non handicapped children. In the interpretation of the DAP there appear to be a major problem--to what extent does the DAP reflect visuomotor skill and to what extent does it reflect personality. Our scoring of the task was therefore geared to tap three dimensions. (1) Mental age as reflected by the Harris scoring of the DAP. (2) Degree of sophistication reflecting a quality of sex role differentiation and (3) Height, a perceived correlate of self esteem. To help answer the question which we posed we also correlated the findings with our results on the WISC, the ITPA and number of names produced on the interpersonal recall tasks.

In this particular substudy the draw a person test was administered using standard clinical instructions and the child's drawings were scored in accordance with the Harris (1963) scoring scheme. The findings are presented as quotients corrected for chronologic age. However in the intercorrelations with ITPA and number of people the findings are presented in terms of mental age.

The SBH group is inferior on the Harris scoring of the DAP to both the SBNHs (df 53, t=2.33, $p < .05$) and the AMPs (df 79, t=4.47, $p < .001$) groups, the findings are presented in Table G3, and Figure G_1.

Table G3 : Draw A Person (Harris) Quotient SBH, SBNH, AMP

	N	M	SD
SBH	37	72.9	17.3
SBNH	23	87.2	20.8
AMP	44	91.0	14.4

If we examine the changes in DAP with age a number of findings appear (table G4). The SBH lags behind all the groups at all age levels. Both the SBH and AMP groups show progressive declines with age, so that the oldest groups are significantly higher than the youngest groups ($p < .05$). The SBNH group appears to decline during the ages of 8 - 10 but then it rallies from the age of 11 to 15. The findings resemble the age changes in performance quotients of the intelligence tests with about a 10 point lag. This lag fits the normative expectancies of non-handicapped populations according to Harris.

Table G4 : DAP Performance in Performance IQ in 3 Age Groups of SBH, SBNH, and AMP.

	DAP			PIQ	
	N	M	SD	M	SD
SBH 1	15	83.4	15.1	94.6	15.9
SBH 2	10	72.9	17.3	84.9	14.7
SBH 3	12	68.4	14.2	78.9	21.1
SBNH1	8	96.6	23.7	105.7	16.9
SBNH2	7	76.1	18.8	88.1	19.7
SBNH3	8	87.5	16.3	99.9	19.6
AMP 1	16	95.3	12.3	100.7	15.4
AMP 2	10	93.8	14.4	106.2	10.6
AMP 3	18	85.4	15.3	100.3	10.9

From the foregoing we might conclude that DAP performance mirrors competence on performance section of intelligence tests for all of our groups. Support for the assertion may be found in Table G4. However further examination of the DAP in terms of its correlates with the ITPA and the number of people named on the interpersonal recall suggests that the DAP also correlates with different facets of psycholinguistic skills for the three disability groups. For example, DAP correlates with AD, VD for both SBH and the SBNH but fails to correlate with either of the encoding tasks (ME & VE). On the other hand the correlates generated by the AMP group suggests that DAP is related to a different combination of psycholinguistic abilities--VD and ME. Visual decoding and motor encoding seem closer to each other than AD is to the performance tests, so that the findings for the SBH and SBNH groups are puzzling. Finally it should be noted that the DAP correlates with the number of people named on the interpersonal recall tasks for all three of our groups and to verbal intelligence in the SBH and AMP groups.

Table G5: Correlates of DAP

	VIQ	PIQ	FSIQ	VD	ME	VE	AD	People
AMP	** .49(45)	** 57(43)	** .53(43)	** 63(27)	* 55(17)	10(18)	27(27)	* .34(45) ---
SBNH	.25(28)	* 55(20)	* .47(19)	* 57(19)	31(13)	.45(14)	* 50(17)	* .43(21)
SBH	** 49(33)	** 72(33)	** 69(34)	** 63(29)	33(23)	.31(22)	** 55(26)	** 49(29)

** $p < .01$ *$p < .05$

Since we determined that there were differences among the performance of the 3 groups, we wanted to examine the differences between the SB and AMP groups further. Therefore we took the 23 SBH, 20 SBNH and 34 AMP drawings and divided them into 3 categories.

> CATEGORY I-- UNSOPHISTICATED. This category included all drawings judged to be primitive either because their sex could not be determined or because the parts of the body were not well delineated.
>
> CATEGORY III -SOPHISTICATED. This category included more mature drawings. Not only was the sex of figures in the category recognizable but the figures often wore clothing and there was clear differentiation between torso and limbs.
>
> CATEGORY II. Those drawings not as primitive as those in Category I or as sophisticated as those in Category III .

Two judges, both of whom had had experience working with amputee and spina bifida children but with no particular training in figure drawing analysis, placed each of the 35 drawings into Category I, II, III. The judges knew that they were dealing with figure drawings of handicapped children, and they knew the age group of the subjects. The judges agreed in 83% of the cases.

Each of the three categories was assigned a numerical value. Category I was assigned #1, Category II was assigned #2, and Category III was given #3. Each drawing was thus given a total score based upon the decision of the two judges. For example, one drawing may have been placed in Category I by one judge and Category II by the other, so that its total score would be three. The numerical scores of the drawings thus ranged from a low of 2 to a high of 6, which corresponds to the unsophisticated-sophisticated dimension. Finally, the numerical scores of the drawings were divided into three groupings: those drawings that received a total score of 2, those that received a total score of 3 or 4, and those that received a total score of 5 or 6.

Table G_6: Distribution of drawings of the 3 disability groups into 1 of the 3 numerical groupings.

	(2)	(3+4)	(5+6)
SBH(23)	14	3	7
SBNH (20)	7	7	6
AMP (34)	9	13	12

Chi-square analysis indicates that the drawings of the AMP are more sophisticated than those of the SBH ($X^2 = 7.14$, df=2, $p < .05$). The drawings of the SBNH are slightly more sophisticated than those of the SBH (the X^2 was just short of significance). There were no differences between the SBNH and AMP on the sophisticated-unsophisticated scale.

The literature indicates that the height of a subjects DAP in an index of his self-esteem. We measured the height of our subjects DAP to determine if this measure would differentiate our groups. TableG7 indicates that the 2 spina bifida groups had shorter figures than those of the AMP. However these differences did not reach statistical significance.

Table: G_7 Height of DAP

	N	M	SD
SBH	25	120.76mm.	52.47mm.
SBNH	19	120.58mm.	60.72mm.
AMP	35	126.05mm.	49.88mm.

Table G8: Interrelationships between DAP MA, Sophistication, Rank and Height of Figure

	SBH	SBNH	AMP
MA vs Soph.	.33(17)	-.29(23)	.48(23)
MA vs Height	-.07(23)	-.46(12)	.23(23)
Soph. vs Height	.06(20)	.48(16)	.01(32)

There are three inferences which may be drawn from Table G8:

(1) The drawings of the AMP are in accord with expectation in that increasing MA is associated with increasing sophistication and increasing height (although short of significance).

(2) In the SBH group increasing MA is associated (although not significantly) with increasing sophistication but not increasing height.

(3) In the SBNH group increasing height is associated with less sophisticated and shorter drawings.

Two things may be concluded from the above inferences.

(1) Although drawings may reflect mental functioning on performance tests they also reflect different factors in different groups.

(2) The decline in height which is associated with increasing age in both SB groups, even though not significant raises an interesting point. Due to the fact that the correlation is opposite to our expectation, that is height may be associated with elaboration rather than self-esteem. We attempted a small test of this hypothesis. We divided the drawings of both SB groups into 2 subgroups: drawings above 100mm. and drawings below 100mm. We took our 4 sets of drawings and checked to see if the clinical psychologist who saw these children for evaluation had rated them as being hyperverbal. We found that the shorter drawings (under 100mm) were given by those SBH children who were rated as hyperverbal ($X^2=4.80$, df=1, $p < .05$). This was not the case of the SBNH group.

This allows to speculate on the concept of disassociation and what it means in brain-damaged children. We would suggest that it indicates that the normal skills in problem solving do not cohere. However there are coherences of skills which deviate from normal patterns and indeed the problem in brain-damaged children may not be a problem in disassociation of skills but a problem of reassociation so that they appear to be manifesting different kinds of lawfulness.

Clinical Descriptions of Spina Bifida Children

Table G_9 : Frequency of 5 Adjectives used in Describing Spina Bifida Children.

	N	Depressive	Anxious	Angry	Hostile	Talkative/ Hyperverbal
SBH over 10	16	7	7	2	0	5
SBH under 10	26	7	17	3	2	21
SBNH over 10	14	7	3	3	1	1
SBNH under 10	17	3	4	0	0	8

The reports of a clinical psychologist who examined 73 Spina Bifida children (42 SBH, 31 SBNH) were read by a person who neither saw these children for psychological evaluation nor as part of the testing for this project. Frequency counts were made of the 5 adjectives most often used in the clinical descriptions of the children on whom these reports were based. These adjectives were culled from clinical impressions rather than test data.

The older SBNH apparently were more depressed and angry than the younger SBNH, while the younger SBNH talked more than the older SBNH. On the other hand the younger SBH were more frequently hyperverbal and anxious than the younger SBH--Both groups of Spina Bifida children tend to become more depressed with age.(Table G_9).

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A DEVELOPMENTAL STUDY OF REVERSAL LEARNING IN CHILDREN WITH SPINA BIFFIDA AND CHILDREN WITH CONGENITAL AMPUTATIONS

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Researchers and clinicians working with the brain-injured have often characterized these subjects as having a difficulty in concept formation. To a large extent, such statements are derived from clinical observations or from intelligence tests. The purpose of the present study was to evaluate the notion of a conceptual deficit in a group of children with brain-injury, as exemplified by children with spina bifida, from a learning standpoint. The concept of verbal mediation is used by many S-R theorists to account for the processes involved in problem-solving and conceptualization. Perhaps the most prominent elucidation of mediational theory is the one developed by H. H. Kendler and T. S. Kendler. Essentially, a mediator is an internal response which bridges the gap between the external stimulus and the overt response. The reversal learning paradigm has been widely used to test aspects of mediational theory. The major concern of the present study was to ascertain whether there are differences in reversal learning between disabled children with brain-damage and a group of disabled children without known brain damage, at different age levels.

Recent reviews of the literature on reversal learning have stressed three different processes underlying reversal learning. Kendler and Kendler stress the importance of verbal factors. Tighe and Tighe have raised the importance of perceptual processes while Wolf feels that attentional factors are the major determinants of reversal learning. Most research with humans has been directed toward assessing the importance of verbal factors in reversal learning. This emphasis on verbal factors has led a number of investigators to study the "exceptional child." For example, House and Zeamon, O'Connor and Hermelin have studied mentally retarded *S*s, while Youniss and Furth have employed deaf children. In all cases, *S*s were chosen who had a clear-cut verbal deficiency. In contrast, the present study was directed toward assessing differences between a group with impairment to the central nervous system which previously interfered with perceptual processes, while verbal abilities were relatively intact (at least Average Verbal IQ) and a group of disabled children (congenital amputees) without any known brain-damage. In general, it was anticipated that studying organic impairment from an experimental learning viewpoint would clarify some of the deficiency these children have in problem-solving.

The major issue under investigation is whether children with damage to the central nervous system would be impaired in mediation processes, even though they were of normal verbal intelligence. A secondary concern is whether there are different developmental patterns in mediational processes in brain-injured and non-brain-injured children.

METHOD

Subjects: At three age levels (5-7, 8-10, 11-15)

Sixty-four children with spina bifida comprised the group with damage to the central nervous system. All of these children had evidence of neurological impairment as manifested by incontinence of urine. Eighty percent had hydrocephalus and various degrees of impairment in the use of limbs. Previous studies in our center have indicated that children with spina bifida are characterized as having difficulties with perceptual-motor problems, while their verbal abilities seem to develop in a normal manner. Thirty-five children, at the same age levels, with either upper or lower congenital amputations, comprised the nonneurologically involved disabled group. All children were tested at the Institute of Rehabilitation Medicine.

Procedure

An optional reversal learning procedure reported by T. Kendler was administered to the total population. The reversal learning situation is essentially a transfer from an initial discrimination to another discrimination. The task requires the child to make an initial discrimination from a pair of stimuli which differ on two dimensions (i.e. each dimension has two values: brightness; black-white, and size; small-large). After the child has learned the initially correct discrimination, a shift to a new value is instituted. In the present procedure, this direction of the shift was optional. The *S*s who perform a reversal shift, switch to a value within the same stimulus dimension as previously responded to (i.e. from white to black, or small to large). A nonreversal shift is a shift to a value in a new dimension (i.e. from white to small or large to black, etc.). The procedure is described in the writings of Kendler (1960).

Material

The 4 stimuli were made of wood. The 2 large blocks were 4 in. wide. One was enameled black; the other, white. The 2 small stimuli were 1 in. in width; one white and the other, black. The large white square (LW) was always paired with the small black (SB), and the large black (LB) was always paired with the small white (SW). Additional material consisted of a rubber pail, small cup, and colored marbles which served as reinforcers during the learning task.

RESULTS

The overall results of the study were as follows: (*a*) There was no difference between the groups in preference for reversal shifts, as well as verbalizing the correct solution. *(b)* The amputee group required fewer trials in making the correct initial discrimination ($p < .05$, one tailed). (*c*) The spina bifida group had a significantly greater number of children who could not make the initial discrimination (12 spina bifida, 2 amputee, $p < .05$). (*d*) There was a highly significant correlation between ability to verbalize solutions and reversal shifts in the amputee group (r .91, $p < .01$), while in the spina bifida group the correlation was insignificant .17.

The results with respect to age level were: In both the youngest (5-7), and the oldest age groups (11-15), the non-brain-injured child required fewer trials ($p < .05$). There was a significant correlation at all three age levels between verbalization of solution and reversal shifts in the amputee group, while this relationship was only significant at the oldest age level in the brain-injured group.

DISCUSSION

The results of the study appear to isolate two areas of cognitive deficiency in the spina bifida group. The first area of deficiency is concerned with the spina bifida child's orientation to a task and is reflected in the slower learning scores and the large number of young *S*s who failed to make the initial discrimination. The major problem seems to center around a lack of ability in organizing relevant cues in a problem-solving situation. This deficiency in using orienting responses has also been observed by House and Zeaman in their work with retarded children. A similar difficulty has been noted by the writers in their observations of these same organic children's handling of educational material. Clearly, an inability to attend to and sort out relevant cues in the environment leads to a type of confusion and impotence often reported by clinicians.

The second area of deficiency is an apparent dissociation of verbal and action skills. The amputee group showed the anticipated coherence of performance in learning. Children who used hypotheses (reversers or mediators) in problem-solving, were able to verbalize the correct solutions. By way of contrast, the spina bifida children showed a dissociation in performance. Children who apparently used hypotheses did not necessarily verbalize the correct solution. Children who verbalized the correct solution, did not necessarily use hypotheses. Interestingly, this dissociation disappeared in the oldest brain-injured group. The awareness of this dissociation of verbal and motor skills is obviously quite important to the educator and the rehabilitation worker. In education, it is often assumed that if the child is able to make relevant verbal comments, the same child is able to follow such verbal commands with appropriate action. In rehabilitation, much training of motor skills is dependent on the congruence between the verbal system and the action system.